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THE UNITED STATES RECLAMATION SERVICE.

BY

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The third field season of the U. S. Reclamation Service since its organization on June 17, 1902, is closed, except in the Southwest, where climatic conditions do not prevent continuance of field work throughout the year.

A summary of the reports of the district engineers for the thirteen States and three Territories in the arid region furnishes most convincing evidence that the Reclamation Service has been organized on broad and thoroughly practical lines, which are calculated to insure the largest measure of results with the most economical expenditure of the reclamation fund.

Since the inception of the Service the general conduct of the work has been under the charge of Mr. Frederick H. Newell, as head of the Hydrographic Branch of the Geological Survey and Chief Engineer of the Reclamation Service. He has from time to time added to his advisory board consulting engineers and specialists of experience and ability, the general staff now including the following:

Arthur P. Davis, Assistant Chief Engineer; J. B. Lippincott, H. N. Savage, J. H. Quinton, and C. H. Fitch, supervising engineers; G. Y. Wisner, B. M. Hall, W. H. Sanders, A. J. Wiley, and C. S. Schlichter, consulting engineers; Morris Bien, engineer-in-charge of investigations of land titles; N. H. Darton, hydrographer-in-charge of the western section of hydrology; H. A. Storrs and O. H. Ensign, electrical engineers; G. A. Hammond, superintendent of borings; T. H. Means, engineer of soils; and others.

The proceeds from the sales of public lands in the thirteen

States and three Territories constitute what is known as the reclamation fund. The following table gives by States the total amount of funds received from the sale of public lands during the fiscal years 1901–04. For 1904 the figures are approximate only, but the totals are sufficiently exact for the purpose of estimates:

TABLE I.

State or Territory.	1901.	1902.	1903.	(Approximate) 1904.	Aggregate.
Arizona	$42,586.16	$39,187.35	$48,360.20	$36,270.15	$166,403.86
California	205,030.40	298,240.36	839,221.40	629,416.05	1,971,908.21
Colorado	254,889.88	374,105.13	549,812.89	412,359.66	1,591,167.56
Idaho	206,645.36	300,803.27	650,331.95	487,748.97	1,645,529.55
Kansas	20,188.78	28,946.94	27,836.50	20,877.36	97,849.58
Montana	367,342.31	405,035.49	558,071.49	418,553.61	1,749,002.90
Nebraska	102,963.24	132,234.94	138,728.70	104,046.54	477,973.42
Nevada	9,183.47	14,230.61	14,136.76	10,602.57	48,153.41
New Mexico	75,203.06	72,034.60	154,265.49	118,629.11	420,202.26
North Dakota	449,474.96	778,021.35	1,244,916.47	933,687.36	3,406,100.14
Oklahoma	370,464.93	638,330.44	864,766.83	678,575.13	2,552,137.33
Oregon	364,988.62	543,972.44	1,896,970.68	1,422,728.01	4,230,659.75
South Dakota	113,274.20	194,288.17	248,696.14	186,522.09	742,780.60
Utah	98,416.00	48,408.38	88,872.38	66,654.27	302,351.03
Washington	257,180.95	536,907.82	1,109,299.54	831,974.67	2,735,362.98
Wyoming	206,989.59	178,773.24	279,709.18	209,781.87	875,253.88
Total	$3,144,821.91	$4,585,520.53	$8,713,996.60	$6,568,497.42	$23,012,836.46

Examination of the above table shows that the largest contributions to the fund have been received from Oregon, North Dakota, Washington, Oklahoma, and California. In the Pacific Coast States along the Coast Range are the most valuable timber-lands on our continent, and from this source has come the principal revenue of the land offices in those States. North Dakota and Oklahoma, one almost wholly in the humid and the other partly in the semi-arid belt, have enjoyed a land boom, and thousands of settlers have taken up Government land.

The receipts from public land sales show a falling off in 1904, and it is probable that the fund reached its maximum in 1903, and in succeeding years will gradually diminish. This is to be expected, for the reason that the cultivable areas have largely passed to private ownership. Vast areas of timber-lands have been included in forest reserves, thus eliminating these as sources of future income. The unoccupied areas, for the most part, consist of rough mountain slopes, high bench lands, and valleys deficient in rainfall or running streams. Until expensive irrigation works are constructed these valleys will continue as part of the public domain.

Laying Out the Work of Reclamation.

In each of the arid States and Territories a district engineer has been placed in charge of the work of investigating irrigation possi-

bilities, directing the operations of numerous field parties, and preparing preliminary plans for submission to consulting boards appointed by the Chief Engineer. The following is a list of the district engineers:

L. C. Hill, Arizona; Homer Hamlin, California; A. L. Fellows, Colorado; D. W. Ross, Idaho; C. C. Babb, Montana; J. E. Field, Nebraska; L. H. Taylor, Nevada; F. E. Weymouth, North Dakota; W. M. Reed, New Mexico; G. H. Matthes, Oklahoma; J. T. Whistler, Oregon; R. F. Walter, South Dakota; G. L. Swendsen, Utah; T. A. Noble, Washington; and J. Ahern, Wyoming. Each of these engineers is made a member of the board of consulting engineers at all meetings held for the purpose of considering projects in his State.

When it is considered that the field covered by the district engineers and their assistants includes an area equal to two-fifths of the United States; that the regions investigated are generally far removed from settlements, embracing vast areas of sage brush, desert and rough mountain country, the progress of the bureau has been rapid. The results have been of such value that actual construction has been carried on for nearly a year on projects in Arizona and Nevada.

A better conception of the scope of the work may be had by examining the map herewith, which shows: 1st, the projects upon which work has been begun; 2nd, projects which have been approved by the Secretary of the Interior; 3rd, the locations of reconnaissance surveys during the year.

The following table shows by States and Territories the projects which have been approved by the Reclamation Service, and the amounts set aside from the reclamation fund for construction:

PRINCIPAL RECLAMATION PROJECTS.

Arizona	Salt River	$3,000,000
California	Yuma	3,000,000
Colorado	Gunnison	2,500,000
Idaho	Minidoka	2,600,000
Montana	Milk River	1,500,000
Nebraska (Wyo.)	Pathfinder	1,000,000
Nevada	Truckee	3,000,000
New Mexico	Hondo	275,000
North Dakota	Fort Buford	1,200,000
Bismarck	Pumping project	250,000
Buford-Trenton	" "	300,000
	Forward	$18,625,000

	Brought forward.	$18,625,000
Oregon	Malheur	2,000,000
South Dakota.....	Belle Fourche	2,100,000
Utah	Utah Lake.....	1,000,000
Washington	Palouse..... ...	1,500,000
Wyoming.....	Cody	2,250,000
Total.....		$27,475,000

WORKS UNDER CONSTRUCTION.

Actual construction was begun in April, 1904, on the Salt River project in Arizona. This is a work of extraordinary interest to the Service, by reason of the peculiar and difficult engineering features involved. Sixty miles above Phœnix, and immediately below the mouth of Tonto Creek, the Salt River flows through a deep and narrow rock-walled gorge. The engineers propose to lock these walls together with a dam 210 feet high, 180 feet wide on the bottom, and 700 feet long on top, constructed of masonry as firm and as enduring as the hills from which it will be hewn. This lofty dam will hold in check the flood and normal discharge of Salt River, creating a lake 25 miles or more in length, and conserving 1,200,000 acre-feet of water. The stored waters will be turned into the river channel, to be caught up again by canals in the vicinity of Phœnix and turned upon from 160,000 to 200,000 acres of land.

In the construction of the dam, which is to be one of the most remarkable structures of its kind in the country, more than 200,000 barrels of cement will be required. Owing to the inaccessible locality of the dam site, it was found that the cost of cement delivered at that point was prohibitive. Excellent materials for the manufacture of a high quality of cement were found in the vicinity, and authority was asked and granted for the erection of a mill above the site proposed for the dam. A contract has been awarded for the work to be completed by the first of January. It is expected that the contractors who are excavating the power canal will complete their work by the first of May, 1905.

At the dam site, and at other points along the river where favourable sites exist, power will be developed and utilized for pumping, power being transmitted to sub-stations, and from these distributed at a lower voltage to pumping stations in the valley. Special interest attaches to the power development of this project from the fact that it may be partly utilized for the reclamation of large areas belonging to the Pima, Papago, and Maricopa Indians, whose distress and suffering, by reason of the deficient

water supply on their reservation, have been made the subject of numerous appeals to Congress for relief. The Indian lands apparently are underlain by good water-bearing strata at moderate depths; and with cheap power, developed on the Salt and Gila Rivers, it is believed that several thousand acres can be reclaimed and rendered productive by the Indians. The estimated cost of the Roosevelt dam and power system is $3,200,000.

ROOSEVELT DAM SITE, SALT RIVER, ARIZONA.

The plans of the reclamation engineers in Nevada are so broad and comprehensive, involving the storage of the floods of the four principal rivers of that State, that the work has been subdivided. The attention of the Service was given first to the sub-project on the Truckee River, and contracts to construct the main canal from this stream were signed in August, 1903. The work is now practically complete. In August, 1904, contracts were signed for the main lateral systems for utilizing the waters of this canal; and on December 15 proposals were opened for constructing about 150 miles of distributing ditches, which will complete the irrigation system for about 50,000 acres of land. The Secretary of the Interior has set aside the sum of $3,000,000 for this project.

Projects Ready for Construction.

Colorado.—In Colorado the attention of the Service has been concentrated principally upon the Uncompahgre project, which contemplates the irrigation of lands in the Uncompahgre Valley, the waters being diverted from Gunnison River. The two drainages are divided by the Vernal Mesa, which has a general elevation of 8,000 feet. At the point of diversion the Gunnison is in a profound cañon more than a thousand feet below the mesa's summit. By a dam in the Gunnison River the waters of this stream will be diverted into a tunnel 6 miles long, excavated under the Vernal Mesa, and conveyed therein to canals in the Uncompahgre Valley. Contracts have been awarded on this project for the construction of a telephone system, the south canal, and the great Gunnison tunnel, and work is being actively pushed on the former. It is expected that the contractors will begin the tunnel in the very near future, and this work will require more than three years for its construction. The estimated cost of this project is $2,500,000, and the area reclaimed will be approximately 100,000 acres.

Idaho.—In September, 1904, contracts were awarded for the diversion dam and a portion of the main canal from Snake River, near Minidoka, Idaho. The contractors are making active preparations for pushing this work throughout the winter months. By this project it is proposed to reclaim from 130,000 to 150,000 acres of desert land belonging to the United States. The natural conditions are unusually favourable for the development of power, and it is proposed to establish pumping plants which will develop 17,500 horse-power during low stages of the river. This power will be utilized for the irrigation of 76,000 acres of land in the Minidoka tract which lies at too high an elevation to be supplied through a gravity system. The estimated cost of the Minidoka project is $2,600,000.

New Mexico.—The reclamation engineers have located a feasible project in New Mexico in the valley of the Hondo River, about 12 miles southwest from the town of Roswell. The reservoir site was found and surveyed, and authority was given by the Secretary of the Interior to proceed with the project. Contracts were let September 6th for the construction of six miles of canal, several earthen dams, together with headworks, outlet works, sluice gates, etc. It is estimated that this project will cost $250,000, and will supply water to 12,000 acres.

NEBRASKA AND WYOMING.—Preliminary work this season has developed an attractive project on the North Platte River. This project involves some interesting inter-State features, as the lands to be irrigated are in Wyoming and Nebraska. As a result of the preliminary surveys an excellent reservoir site of large capacity has been located at the beginning of the cañon below the mouth of Sweetwater River. It is proposed to construct here a dam 75 feet in length at the bottom, 250 feet long on top, and 200 feet high. Surveys show that the capacity of the reservoir thus created will be 1,080,000 acre-feet, which it is believed is sufficient to contain all the flood and surplus waters of the North Platte at that point. The estimated cost of this dam is $1,000,000. To reach the irrigable lands the canal will have a length of 140 miles, making it the longest canal in any of the projects under consideration. The plans call for an expenditure of not less than $5,000,000 to complete the system. The acreage is not fully determined, but it is believed sufficient land can be included to bring the initial cost within $25 per acre. Proposals for the construction of the outlet tunnel have been invited, and bids will be opened in Washington January 9th.

NORTH DAKOTA.—In North Dakota careful investigations were made of two proposed pumping projects, one at Bismarck and the other near Fort Buford. Both were decided to be feasible, and the Secretary of the Interior set aside $550,000 for construction. On the north side of the Missouri River a series of flats extends from the Montana–North Dakota line to about 4 miles east of Williston, North Dakota. Another series of similar flats is located near Bismarck, the combined area of irrigable lands approximating 38,000 acres. These flats are considerably higher than river, and pumping will be necessary to cover them with water. Lignite of fine quality, apparently inexhaustible in quantity, found near by, furnishes fuel at a maximum cost of $2 per ton. Completion of these projects depends upon the action of the owners of the land under them, who must pledge their property as security for the repayment to the Government of the cost of the irrigation works.

OREGON.—In Oregon the attention of the service has been given principally to the Malheur project in the southeastern part of the State. By this project it is proposed to supply water to 90,000 acres of bench and bottom lands in the valley of the Malheur and Owyhee Rivers. Reservoir sites of ample capacity have been located and mapped, and more than 70 miles of canal lines with topography have been completed. A water users' association, composed of

land owners in the district, has been organized to secure the co-operation of the Government in irrigating lands in private ownership. The detailed plans and estimates will be ready for bids as soon as all the land owners in the valley join this association. The cost of the Malheur project will approximate $2,600,000.

SOUTH DAKOTA.—Maps, plans, and estimates have been prepared of all structures in connection with the Belle Fourche project in South Dakota, and bids will be advertised for on February 1st, 1905. This project involves the reclamation of land to the northeast of the Black Hills in Butte and Meade counties, by the diversion of waters from the Belle Fourche and Redwater rivers into a natural reservoir six miles from the town of Belle Fourche. From the reservoir the water will be distributed to lands in the valley on both sides of the Belle Fourche River, the water supply being sufficient for the irrigation of approximately 100,000 acres of land. The estimated cost of the Belle Fourche project is $2,100,000, and three years will probably be required for its completion.

RECONNAISSANCE AND PRELIMINARY SURVEYS.

A large number of parties have been employed during the past year in all of the arid States and Territories on reconnaissance and preliminary surveys. Numerous petitions have been received from all parts of the arid regions, requesting that investigations be made of projects believed to exist in each locality, and much of the reconnaissance work has been undertaken in compliance with these requests. Only the most important of these surveys are noted here.

ARIZONA.—Hydrographers and hydrologists were engaged in several parts of Arizona during the season. Valuable and important data were secured concerning the underground water supply and the areas to which it can be applied to advantage. Part of this investigation was carried on in co-operation with the officials of the Indian Office, who are endeavouring to relieve the distressing conditions of several thousand Indians who have been brought almost to starvation on account of the water famine.

CALIFORNIA.—California, with its vast area and varied topography, has received the earnest consideration of several parties of reclamation engineers during the season. An important branch of the investigation, however, has been carried on in the drainage basin of the Colorado, where the engineering problems have been found most difficult of solution. Although the entire watershed of

this stream is in the United States, a small portion of its lower valley is in Mexico. While it receives no water from the latter country, the Colorado is classed among the international streams, and, under existing treaties, is considered as a navigable river. Diversion of the stream for irrigation is not permissible under existing law if navigation is affected thereby. Last winter Congress passed a law authorizing the Secretary to construct irrigation works to irrigate lands on both sides of the river above Yuma, Arizona. The plans of the engineers have been perfected, and it is estimated that 107,000 acres can be irrigated at a cost of $35 per acre. As outlined, the project includes an expensive system of levee and irrigation works, together with a diversion dam and long canals.

In California the field investigations in 1904 covered a wide range of territory. Considerable attention was given to the Sacramento Valley, the work here being carried on in co-operation with the State. The field is so large that another season will be required before it can be completed. In the eastern part of the State a study was made of both surface and underground waters in Owens Valley. On the northern boundary of the State the preliminary surveys indicated a feasible project in the basin of Klamath River, which includes irrigable lands in both California and Oregon. The project is an attractive one, as the water supply is ample for a large body of irrigable land in that locality. The engineering features are unique, inasmuch as it is proposed to reclaim a large body of marsh lands, at the same time using the drainage waters for irrigating areas farther down the river. Enormous undeveloped waterpowers have been found on Klamath River, which may later be utilized for pumping water to higher levels than those which can be reached by gravity systems.

COLORADO.—The preliminary plans for a project in northwestern Colorado were completed this year, and are ready for the consideration of the consulting engineers. By this project it is proposed to divert the waters of White River for the irrigation of 90,000 acres of land in Routt and Rio Blanco counties. The estimated cost of this project is $2,000,000.

IDAHO.—In Idaho field parties have been engaged upon preliminary investigations of two projects, one in the southwestern part of the State, called the Payette-Boise, and the other in the eastern part, known as the Dubois project. The former, in the extent of the irrigated area and productivity of the soil, ranks among the

most important projects now being considered by the Service. The engineering features are comparatively simple, notwithstanding the plans contemplate using the waters of one stream in the valley of the other. The engineers propose to construct a diversion dam in the Payette River and, by means of a canal several miles in length and a short tunnel passing through the narrowest point in the divide which separates the two rivers, turn the waters into the Boise valley. The majority of the land owners in the valley have signified their approval of the enterprise. The acreage involved is nearly 300,000.

The Dubois project, located in the eastern part of the State, is one of considerable magnitude, embracing approximately 200,000 acres of Government land. The reconnaissance work on this project covered 1,570 miles, the surveys of canal lines aggregate 369 miles, and surveys of reservoirs 116 miles. Another season will be required to complete the preliminary work.

MONTANA.—Montana has proved a most inviting field for the prosecution of reclamation investigations during the past year, and prospects are encouraging for the development of several large projects which will make productive and valuable many thousand acres of land now arid and worthless. Attention in 1904 has been given chiefly to the Milk River project, in the northern part of the State. The progress of the work here has been considerably delayed by questions of an international character which have arisen, and which ultimately must be considered by the State Departments of both Governments. The project contains some unusual features, due to the fact that the Milk River, which rises in Montana, flows for many miles through Canadian territory before it turns southward to join the Missouri in Montana. At several points along its channel in Canada its waters are diverted for irrigation, and complications over prior water rights are certain to arise in the event that our Government should attempt to control the waters of this stream. The first plan considered by the engineers was to impound the waters of St. Marys River in the lakes of the same name in northern Montana and, by a canal, divert them into Milk River, which heads near the lakes. St. Marys River has a high mountain drainage, and is a constant stream; but, unfortunately, it flows north into Canada, and never comes back. To use the flood-waters of this stream to best advantage they must be permitted to run down Milk River for several hundred miles, partly in Canada, before they can be diverted

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to irrigable lands in Montana. Unless satisfactory arrangements can be made with Canada for an equable division of the water, Montana irrigators will be at the mercy of the Canadian appropriators, who, of course, have first use of the water. For a portion of the summer the engineers have been working on plans to store the floods of Milk River in natural basins, and detailed estimates of the cost and of the irrigable area will soon be prepared for submission to the Chief Engineer.

While another year will be required to work out all the details of the Sun River project in this State, the preliminary surveys made this year indicate that a large project, embracing 300,000 acres, exists in this drainage basin, for which the water supply is ample.

By authority of Congress the Reclamation Service this spring made a preliminary reconnaissance and survey of the ceded lands in the Crow Indian reservation. The report of the engineers is favourable, and it is believed that the final surveys will develop a project which will reclaim 200,000 acres of fertile land in this section.

On the Yellowstone the surveys have developed a feasible project near Glendive, where a canal 70 miles in length will cover 60,000 acres in Montana and North Dakota. The estimated cost of this project is $1,800,000.

New Mexico.—Preliminary investigations in New Mexico this season covered a large portion of the territory and developed feasible projects on three streams. Of these the most important is undoubtedly that on the Rio Grande, known as the Engle project. Presenting as it does a satisfactory solution of the serious international controversy over water rights on this stream, which for a quarter of a century has been at fever heat in the lower valley, future history may decide that Peacemaker is a more appropriate name. The Engle project contemplates the storage of 2,000,000 acre-feet, or the entire normal and flood discharges of the Rio Grande, in a deep and narrow reservoir so large that 82 years of the silt-laden floods of this torrential and turbid stream will not destroy more than 60 per cent. of its efficiency. An area of 180,000 acres of land likened unto the famous Nile valley in fertility and productivity will receive an abundant and constant water supply, and a region which is now rapidly returning to its original state, that of a desert, through lack of water, will furnish homes for 90,000 happy and contented people. The entire cost of the reservoir, diversion dams, and canals is estimated at $7,200,000, or

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$40 per acre. During the recent Irrigation Congress at El Paso the Chief Engineer of the Reclamation Service fully explained all the plans of the Engle Project, and the delegates from Mexico, Texas, and New Mexico voiced their approval without a single dissenting vote. The Engle project renders the international dam unnecessary. Its construction will settle for all time the deplorable and unhappy conditions which have so long existed in the valley. It will inaugurate an era of good feeling, of rapid and substantial development, in a section where irrigation is older than our written history.

The Urton project on Pecos River will divert the waters of this stream by means of a dam and a canal 35 miles long, the waters being stored in a large natural basin or reservoir provided with an outlet tunnel and distributing canals. The cost of the work will approximate $1,000,000, and the acreage supplied will be 60,000.

The Las Vegas project contemplates conducting water from Gallinas and Sapello Rivers to a point about five miles north of Las Vegas into a natural reservoir created by constructing a dam across a narrow arroyo. Investigations of the water supply will be continued through the year. A topographic map of the reservoir site and irrigable lands has been made.

OKLAHOMA.—Numerous investigations have been made in Oklahoma for irrigation possibilities, special attention being given to a study of water storage propositions in the country east of the Wichita Mountains and in Beaver County. Very careful investigation has also been made of the underground water resources. The work in this territory has not progressed to a point where a feasible project has yet been decided upon, and the surveys will be continued during 1905.

UTAH.—Two projects have occupied the time and attention of the engineers in Utah during the season, one at Utah Lake and the other at Bear Lake. Both projects are full of complications owing to the heavy diversion of the waters of the streams entering into and flowing from these lakes, and at least another year will be required to complete the preliminary investigations.

WASHINGTON.—The principal reclamation project in Washington, known as the "Big Bend" project, is of such magnitude that the present state of the irrigation fund does not at this time warrant its inauguration. In its entirety the Big Bend project involves an expenditure in excess of the whole reclamation fund. Nearly 5,000,000 acres of fertile lands are included within its boundaries,

and the storage of the waters in numerous lakes and rivers is contemplated.

The work for the past season has been concentrated chiefly upon the Palouse project in the southeastern part of the State, preliminary surveys having shown its feasibility to the extent of irrigating at least 100,000 acres. Several parties have been engaged upon surveys of canal lines, irrigable lands, and reservoir and dam sites, and these data will be ready for consideration during the winter. The estimated cost of the system is $1,395,035.

WYOMING.—In Wyoming a rapid reconnaissance was made for a canal in that portion of the Wind River or Shoshone Indian reservation which is soon to be opened to settlement. The engineers' reports indicate that one or more feasible projects might be constructed there should Congress so order. The lands are exceedingly fertile, the water supply apparently ample, and the engineering features simple and inexpensive.

During a portion of the season work has been pushed vigorously on the Shoshone project, which contemplates the utilization of a portion of the surplus water of Shoshone River for the reclamation of land in the northern part of Big Horn County, Wyoming. A reservoir site has been found on this stream just below the junction of its North and South Forks, where it enters a deep cañon. The plan for a dam and headworks has been passed upon by a board of consulting engineers, and the sum of $2,250,000 was set aside by the Secretary of the Interior in February, 1904. The progress of the work has been delayed owing to unforeseen difficulties which were encountered in boring for bed rock at the dam site. Preliminary to the boring at the main dam work was begun on the wagon road into the cañon for the transportation of materials and telephone lines from the railroad to the dam site. The irrigable area to be covered by this project is approximately 103,000 acres.

POWER AND PUMPING INVESTIGATIONS.

The electrical experts of the Service during the past season have made a study of power development and pumping features, the utilization of power in pumping water to higher levels being essential to the success of several of the projects. Some of these projects depend entirely upon pumping water for irrigation. On others it is proposed to utilize natural power sites wherever they can be found in the vicinity, and develop power to cover lands above the lines of gravity systems.

Similar studies have been made also in conjunction with the exceeding[ly] important investigations of underground water resources [of] several important drainage basins, upon which a number of hydro[graphic] surveys have been employed in the West. Plans have been formulated [fo]r developing and utilizing power in construction work, thereby effecting a considerable saving in labour and time and in the first cost of permanent structures.

VAN DER GRINTEN'S CIRCULAR PROJECTION.

BY

G. W. LITTLEHALES.

Owing to the geometrical impossibility of developing a spherical or spheroidal surface in a plane, geographers have adopted various artifices, called projections, for representing, on a reduced scale and on a plane surface, the relative positions of points, lines, or objects on the earth's surface; and, since such positions are usually defined by spherical co-ordinates, the primary object of these artifices is the delineation of these circles of reference so that any point, line, or object intended for representation may be laid down according to its known co-ordinates. These so-called projections fall in three classes or subdivisions. The first comprises the true or perspective projections, like the orthographic and stereographic, in which the framework of parallels of latitude and meridians of longitude is represented as a spectator would see them on a plane surface placed in a definite relative position back of the globe upon and through which he is looking.

The second class is made up of those projections like the Mercator and the conic, in which the lines of spherical co-ordinates are first projected upon a circumscribing cylindrical or conical surface, which is afterwards conceived to be developed upon a plane surface by being cut open along an element of the cylinder or cone and then spread out flat.

The third class includes those projections which are neither formed by projection nor by development, but which are conventional constructions based upon geometrical laws, either assumed or fixed, and not representing the earth in such a way that it could be seen in that form by a spectator in any position whatsoever. Lambert's projection and Mollweide's or Babinet's homolographic

projection belong to this class, which has lately been extended by Mr. Alphons van der Grinten in a purely geometrical construction for the representation of the whole world within a circle bounding meridian by means of a network of parallels of latitude extending from pole to pole and of meridians of longitude extending throughout the circuit of the globe. The accompanying figure 1 will serve to indicate the method of construction. First describe a circle representing the marginal meridian inclosing an area equal to the surface of a sphere or globe of half the diameter of the circle, or, in other words, of twice the diameter of the given globe. Then draw the horizontal and vertical diameters of this circle to represent the equator and the middle meridian respectively. In the figure the equator is represented by the line AOA′, and the middle meridian by the line NOS. As the construction is identical in each of the four quadrants of the circle thus formed, it will be sufficient for the purpose of explanation if the construction is confined to two of the quadrants. Let the line OA′ be divided into a number of parts of the same length equal to half the total number of meridians to be shown on the globe, and the line ON into one-half as many equal parts as are shown along OA′; and let these points of subdivision be numbered as indicated in the figure. To draw a parallel of latitude representing, for example, the sixtieth-degree parallel of north latitude, from the point numbered 6 on the middle meridian ON draw the chord BC perpendicular to ON; and then draw the chord CA′, intersecting the line ON in the point D. The arc of the sixtieth-degree parallel will cross the central meridian ON at the point D. The chord AN is next drawn intersecting the chord BC in the point E, which is to be connected by a straight line with the point A′ for the purpose of locating the point F in which the line EA′ intersects the middle meridian. The chord which subtends the required parallel of sixty degrees of latitude crosses the middle meridian ON at the point F, so that FG drawn perpendicular to ON will represent half of that chord and a circular arc described from a centre J on the prolongation of the line ON and passing through the points G and D will be the required sixtieth-degree parallel of latitude. In a similar manner the remaining required parallels may be drawn.

The meridian lines are constructed by describing from centres, as M, on the line AA′ produced, a succession of arcs passing through the successive points of subdivision of the equator and the points N and S. One-half of one of such arcs is shown in the figure by the heavy line SR.

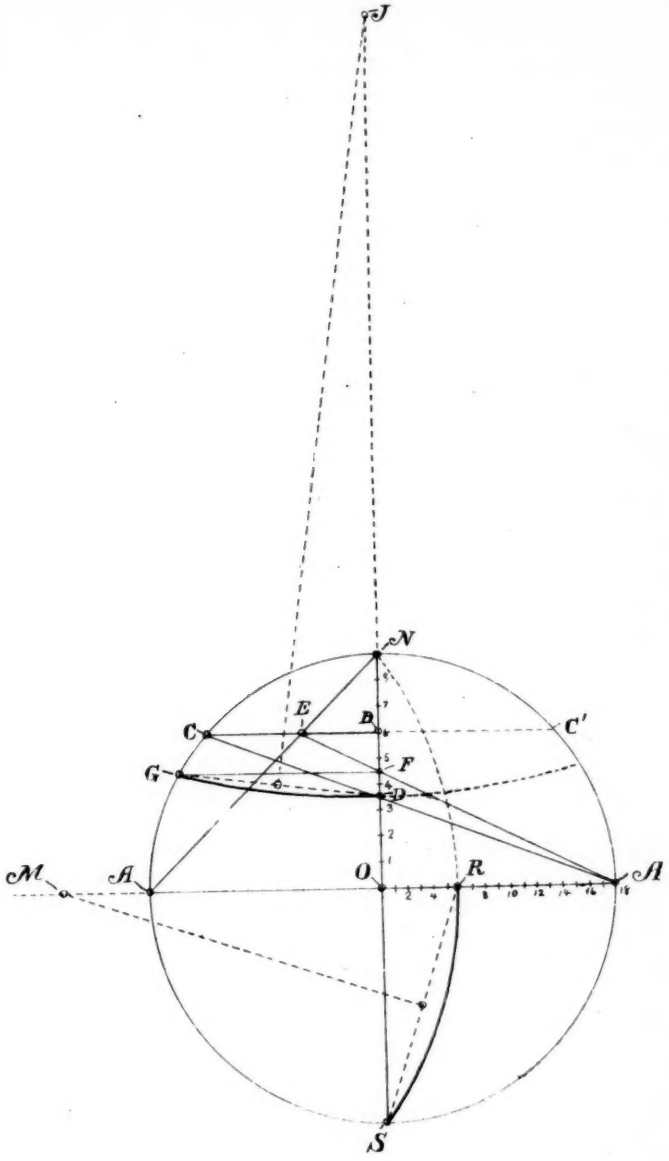

FIGURE 1.

By this method of construction the number of meridians shown is double the number of parallels, so that if the parallels represent ninety degrees on each side of the equator, or a total of one hundred and eighty degrees, the meridian lines will indicate three hundred and sixty degrees; and a map drawn with reference to this network of parallels and meridians is capable of representing the entire surface of the earth.

CONTINENTAL VIEW

FIGURE 2.

The new projection appears to occupy a middle ground between Mercator's nautical chart of the world and Mollweide's homolographic map of the world, avoiding the enormous distortion of the former, by which it becomes impossible to represent the poles at all, and greatly lessening the rapid departure from the true angles of intersection between the parallels and meridians which takes place in the latter. There is no distortion along the equator, and therefore the longitude on the map corresponds with the actual differ-

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ence of time between places situated on the surface of the earth; but the distortion grows with increase of latitude, and becomes a maximum in the polar regions, where, however, the departure from the true size and shape of the earth's features is of the least importance for all the usual geographical and physical uses of maps

In the development upon a plane of any non-developable surface, like a sphere, certain errors are, of course, unavoidable; but any of these errors may be diminished, or even made to disappear altogether, at the cost of increasing some other. Thus in Mollweide's projection much has been sacrificed to secure the characteristic condition of strict proportionality between areas on the sphere and the corresponding areas of the projection; and likewise, in Mercator's, other useful attributes have been given up to attain the characteristic condition of the projection, that the track of a ship pursuing the same true course throughout a voyage will be represented by a straight line drawn between the ports of departure and destination.

Van der Grinten's projection appears to be without special characteristics of the kind just referred to, but to have been designed rather with a view of securing a natural and suggestive method of showing the whole world upon a single projection, in such a manner as to convey the idea of its globular form and to represent its main features without violent departures from their true shapes and areas.

THE FLOOR OF THE NORTH ATLANTIC OCEAN.

Sir John Murray has prepared a long paper and a map in which he deals with the "Recent Contributions to our Knowledge of the Floor of the North Atlantic Ocean." The paper is printed as an *Extra Publication* by the Royal Geographical Society.

The author says that the latest additions to our knowledge of the depths of the North Atlantic come from the expeditions of the Prince of Monaco and from several cable ships. The investigations which he takes into consideration are limited to the North Atlantic Basin between Lat. 20° and 60° N., excluding the tributary seas along the margins. The total area dealt with is about 6,875,000 square geographical miles. Between the limits indicated over 70 per cent. of the area of the sea-floor is covered by water

between 1,000 and 3,000 fathoms in depth, about 20 per cent. is covered by less than 1,000 fathoms of water, and 10 per cent. by more than 3,000 fathoms.

The shallow zone, with depths of less than 1,000 fathoms, forms a border around the North Atlantic Basin along the coasts of Africa, Europe, and North America and along the Iceland plateau which joins the British islands with Iceland. This zone includes the continental slope; and soundings have shown in some places what are believed to be submerged river basins or submarine gullies. This shallow zone also surrounds the islands and island groups and also submarine elevations that do not reach the surface. A list of 22 of the more important submarine elevations, or banks, is given.

The area covered by water between 1,000 and 2,000 fathoms in depth is about one-fourth of the total area. It extends along the eastern, northern, and western borders of the map, outside the shallower zone, and also extends uninterruptedly from the northern border down the centre of the ocean as far as the equator. This central ridge or plateau is probably the most striking characteristic in the bathymetry of the North Atlantic Basin. It is very irregular in outline, and is widest in the northern portion, between Lat. 30° and 50° N.

The area of the North Atlantic sea-floor covered by water between 2,000 and 3,000 fathoms in depth is nearly one-half of the total area. This zone forms two large irregular areas—one to the east, the other to the west of the central ridge or plateau. The eastern area extends as far north as Lat. 53° N.; while the western one reaches Lat. 58° N.

The area of the sea-floor covered by more than 3,000 fathoms of water is about $\frac{1}{10}$ of the total area. To these parts of the ocean basins the term "deeps" has been applied, and distinguishing names are applied to them. Sir John Murray briefly describes the ten "deeps" in the order of their size. The Nares Deep is the largest and most important in the Atlantic. Its maximum depth is 4,662 fathoms, and is situated to the south of Lat. 20° N. Within the limits of the area under consideration the Nares Deep covers over 500,000 square geographical miles of the North Atlantic.

From Sir John Murray's description it is evident that the bed of the North Atlantic presents the greatest divergences in its configuration. From the central ridge or plateau, as well as from deeper water, there rise elevations which form islands like the Azores, Madeira, the Cape Verdes, and Bermuda. On the other hand, what are called "deeps" descend about 20,000 feet below

the level of the waves. If the highest mountain in the world were placed in the Nares Deep it would form an island the summit of which would be about 1,000 feet above the water.

In discussing the temperature, salinity, and currents in the waters of the North Atlantic, Sir John Murray says that they present much greater variety and contrast than in any other of the great ocean basins. This arises from the general atmospheric circulation, which drives a large body of tropically-heated water of high salinity into the Basin, chiefly through the Gulf Stream, and at the same time forces a great mass of cold water of low salinity down from the Arctic Ocean. The temperature of the water at the bottom of the North Atlantic Basin in deep water is between 35° and 40° F. over nearly its whole extent. There is higher temperature at the lesser depths and lower temperature at the entrance to Davis Strait and in the Arctic Ocean. The average temperature over the floor of the North Atlantic is about 2° F. above the average temperature at the bottom of the Indian and South Atlantic Oceans; while the temperature of the bed of the Pacific is intermediate between these.

As considerably more than one-half of the area of the land surface of the earth, or about 26,000,000 square miles, drains into the Atlantic Ocean or its tributary seas, it happens that the detritus from rivers and icebergs is more widely distributed over the floor of the North Atlantic than in the other ocean basins.

The rock fragments collected from the sea-bed by the *Minia* and *Faraday* (cable ships) expeditions in 1903 have been carefully examined, and the conclusion is reached that they were transported into the regions visited, between 34° and 50° N. Lat., by ice from Greenland. Some specimens of rock obtained on the *Faraday* expedition were evidently broken off by the dredging apparatus and brought up in the grapnel. The evidence seems to show that most of these fragments were broken from transported boulders. There seems, however, to be conclusive evidence that volcanic rocks of recent origin project above the deposits on the sea-bed in deep water; but as yet there is no trustworthy evidence that any crystalline or stratified rocks project in this manner.

Besides the material transported from the land, there are now forming in the Atlantic great deposits of glauconite and phosphate of lime:

These are being laid down principally along the continental slopes in depths from 100 to 1,000 fathoms, especially along those shores where there is a great annual range of temperature. Glauconite seems to be intimately associated with deposits containing many fragments of continental rocks in process of alteration and decomposition, and phosphate deposits are more abundant where changing physical conditions bring about a great destruction of marine organisms. In the Spring of 1882, it is believed, the sea-bed for hundreds of square miles off the Atlantic coasts of the United States was

covered to a depth of six feet with dead fish and other marine organisms, whose destruction was brought about by the lateral shifting of ocean currents from different sources and of very different temperatures. In all regions of the ocean where similar phenomena take place large deposits of phosphate of lime and glauconite are now in process of formation.

The most striking feature of the deeper marine deposits of the North Atlantic is the large number of calcareous shells which they contain. It is now definitely ascertained that the vast majority in bulk of these calcareous shells belong to animals and calcareous algæ which live in the surface waters of the ocean. These organisms are much more abundant in the warm, salt, tropical waters than in the colder, less salt waters towards the poles and along the continents where rivers pour their fresh waters into the ocean. On the other hand, pelagic organisms which secrete silica for their shells, skeletons, and frustules are more abundant in the colder and less salt water towards the poles and off the mouths of great rivers, where the oceanic water is diluted by water from the land.

The remains of silicious organisms are not sufficiently abundant on any part of the sea-floor of the North Atlantic to form deposits to which the names of Radiolarian ooze and Diatom ooze have been applied. This probably arises from the large amount of detrital matter carried into the North Atlantic on the one hand, and on the other to the large amount of very warm and salt water in all the central parts of the basin.

Until the present time it has been impossible to form even the vaguest estimate as to the rate of the deposition of Globigerina ooze on the floor of the North Atlantic. It is now recognized, however, that a submarine cable is preserved when in contact with this deposit; and the condition of a cable that was lifted by the *Faraday* in 1903 in 2,300 fathoms makes it perhaps fair to assume a period of ten years for the accumulation of a layer of the deposit one inch in thickness at the place where this cable was lifted.

The area of the floor of the North Atlantic between the parallels of 30° and 60° N. Lat. covered by Globigerina ooze is believed to be 60.94 per cent. of the total area; blue mud, 26.76; red clay, 10.80; or a total area for these three deposits of no less than 98.50 per cent. of the area indicated. This leaves an area of only 1.50 per cent. of the total area for the remaining four types represented—viz., green mud, volcanic mud, pteropod ooze, and coral mud. The principal deposit type is Globigerina ooze.

MARINE FOSSILS NEAR THE SOUTHERN EDGE OF THE SAHARA.

Professor de Lapparent's notes on the finding by the French of marine fossils in the Sahara have been referred to in an earlier number of the BULLETIN. The British members of the Anglo-French Commission which in 1903 delimited the boundary of the French and British possessions between the Niger and Lake Chad also

brought home a considerable number of fossils that were studied at the British Museum by Dr. Bather and Mr. Bullen Newton, who came to the same conclusion that the French scientists had reached. Dr. Bather said of these fossils at a meeting of the Royal Geographical Society on June 27 (*Geog. Jour.*, Nov., 1904):

The fossils are shells and sea-urchins for the most part, and the important point about them s that they denote the existence of a rock of Eocene Age, which had not previously been found in that district. Rocks of similar age occur along the northern part of Africa towards Tripoli and Tunis. They are also known to pass through Arabia, and down towards Somaliland, but in the district south of Algeria no rocks of this age had been previously known to exist. It is true that some years ago Rohlfs mentioned that he had seen ammonites in the neighbourhood of Bilma, which is a little north-west of Chad, and Cretaceous rocks were found there by the officers of the French expedition, and also by Colonel Monteil. The existence of Eocene rocks is a point of importance, not merely as showing an extension of the sea over the southern part of the Sahara in those times, but as affording some confirmation of the views of Suess, who has supposed that, while the lower triangle of Africa was raised out of the sea at a very early geological age, all this Saharan part of Africa, together with the present Mediterranean, Arabia, and the North-West Provinces of India, formed one great Mediterranean Sea. We have here proof for the first time that this sea actually did exist down to Sokoto, or at all events a little to the north of Sokoto, forming the southern limit of the present Sahara. And what is an interesting point in these fossils, and still further confirmation of these views, is that some of the fossils that have been found are of a distinctly Indian character. One of the sea-urchins is of a kind which has hitherto only been described from Sindh. It is very interesting to learn . . . . that a species of the same genus has recently been found in Egypt.

We have, therefore, some evidence—pretty good as these things go—for a definite connection through Egypt and Arabia with the North-West Provinces of India. The Cretaceous rocks which have been proved by the existence of fossils have been proved to come down from the south towards Bilma, north of Lake Chad. . . . .

One of the fossils found by Colonel Monteil lay around for a long time, till Professor A. de Lapparent saw it, and recognizing its importance, had it described by a specialist in paleontology, who discovered that it was the same thing as a kind of sea-urchin which was found quite recently in Beluchistan, in fossils of Cretaceous Age there. Here we have a proof of the connection of India and the Sahara in Cretaceous as well as in the later Tertiary times.

SEMI-CENTENNIAL OF THE AMERICAN GEOGRAPHICAL SOCIETY.

The fiftieth anniversary of the incorporation of the American Geographical Society was commemorated by a dinner at Delmonico's restaurant on the 21st of December, 1904.

One hundred and fifty Fellows and their guests were present.

During the dinner views of a geographical nature were exhibited on the screen.

After dinner toasts were drunk to the President of the United States and the American Geographical Society.

Letters and telegrams of congratulation were read from the officers of the Geographical Societies of Paris, Berlin, Geneva, Vienna, Antwerp, Rome, Budapest, London, and other cities of Europe and America.

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Prof. Libbey then read a concise statement of the history of the Society, which was organized May 22, 1852, with George Bancroft as President, and Henry Grinnell, Francis L. Hawks and John Zimmerman as Vice-Presidents. The Society was incorporated under a special charter, April 13, 1854.

Mr. Bancroft held office until December, 1855, when he declined re-election and was succeeded by Dr. Hawks, who remained in office until 1861. Mr. Henry Grinnell succeeded Dr. Hawks and held office until 1864, when Charles P. Daly was elected. Judge Daly was one of the earliest members of the Society, which he joined in 1855, and he continued to serve as President until his death in 1899. Judge Daly was succeeded, in 1900, by the Hon. Seth Low, who retired at the close of the year 1901. Commander Peary was elected President in January, 1903.

At this point, before introducing the speakers of the evening, President Peary said:

You have heard these unadorned facts in regard to our Society. Eighteen years ago I met Judge Daly for the first time, only to love and revere him, as did every one brought in contact with him. During the years following that time Judge Daly and the Society were constantly my friends. Only during the past two years, however, have I had the honor to be associated directly with the Society. These circumstances put me in an unusually favorable position to speak freely of the Society without incurring the criticism of self-adulation, and to speak of it in a way in which not one of the solid, unostentatious men sitting here at the table with me to-night, who have put the Society in its present position, could be prevailed upon to do.

As Prof. Libbey has just said, our Society has a beautiful home, surpassed by that of no other similar Society. That home is a monument to those who contributed of their means to make it possible, and it is a monument to the indefatigable efforts of the Building Committee (of which Henry Parish and D. O. Mills were members) which moulded the funds into the present beautiful structure.

The Society is to-day, after years of struggle, in a stable financial position. It has, through the munificence of Gen. Cullum and Judge Daly, two gold medals, not surpassed in beauty of design and intrinsic value by the medals of any other Geographical Society.

The last fifty years have been a period of growth for this Society. Now the Society is developed and equipped, and the next fifty years should be a period of activity. There is ample work on land and sea for the Society, ample room for a closer association with the business and commercial interests of this great city, ample room for a closer affiliation with the increasing geographical expansion of the Nation.

And a Society which has on its Board of Directors such men as D. O. Mills, Henry Parish, Anton Raven, and others too numerous to mention, will have availed itself of its utmost privileges and made use of its full capabilities only when it is a vitalizing influence, felt not only in this city and country, but in every portion of the civilized world where enlightened men and women feel an interest in the study of the world upon which we live.

President Peary then introduced the Hon. C. V. Fornes,

President of the Board of Aldermen, who spoke for the City of New York.

President Peary then called upon the Hon. Seth Low, ex-President of the Society, who said of the opportunities before the geographer:

The man who explores to-day does not go single-handed. He has more powerful eyes at his command than Argus ever controlled. With the scientific astronomer by his side he can pierce the vast distances of space. With the botanist and biologist of his party he can try the secrets of the invisible dust. So that the work that remains to be done may be illustrated, I think, by an expression which the artist Gibson once used in a lecture that I heard him deliver. He called the lecture "Things that I Saw at Midnight," and with his finely-trained eyes he was able to identify hosts of living creatures that I could not identify in broad daylight, if they were even then visible.

So that it is not the light that shines, but it is the eye that looks, that determines the vision. And unless it be supposed that the earth has revealed all her secrets to those who have turned its pages, with scanty equipment of scientific knowledge, I think that we may steadily and sturdily believe that the geographical exploration of the future may surpass even the accomplishments of the past in its importance to mankind. I suppose it is not a science like electricity that men are most apt to undervalue in the past, because the immense development of its application within the last twenty years has been so marked; and yet even in electricity we need to remember that it was the patient men of the past that made the modern development possible. Precisely so in this field of geography, or rather, here if anywhere, men are apt to be discouraged by the thought that everything has been accomplished. But we may be sure that there are still opportunities for the able and the gifted explorer to write his name upon the scroll of eternal fame.

President Peary then introduced Capt. A. T. Mahan, who spoke as follows on the United States and the Pacific:

Consider what it meant to America that England was the country nearest to the United States, excepting France and Spain. Search your historical knowledge and see what the effect of those facts has been upon the history of the world. What an enormous thing it is that first of all England got her foot upon this northern continent of America! Consider the development that went on from that time because of that geographical position, principally, and because of the great sea power of England, how gradually English conditions and English traditions, and the law of England and the whole social condition of England forced themselves upon these shores of America and became the leaven by which this country has been leavened. Consider how in the discretion of Providence years passed before any other peoples, except those of England, in any great numbers set their feet here upon the North American continent. Think what it was when our development was held back, as it was until the English traditions of law and political liberty had become familiarly set upon the American continent; and after that was so far established as to make it impossible to shake it, then the floodgates were opened and we have had thrown upon our shores the surplus population of Europe, but not at so early a date that it was possible to swamp the tradition of constitutional law and liberty and order in which the hope of our country consists at the present time.

Now, I say, take that lesson of the past and apply it to the United States and the Pacific at the present time, and at this period of doubt and uncertainty, when men

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do not know where all these things are going to lead us, when we have crystallized public sentiment to a certain extent into imperialism and anti-imperialism, and consider what it means. And from our geographical position you will find that it must inevitably follow that the United States must go on and cannot help going on with all that the United States stands for in the matter of political liberty and political order, to impress itself upon the farther borders of the Pacific, not by conquest, but by precept and example—not by interfering with the people in any illegitimate manner, but simply by mingling with them, by being what through the Providence of God, by reason of the geographical relation of Great Britain, we have become; and what from our geographical position we almost inevitably must become toward the farther countries, not by conquest, not by settlement, but simply by association and by being what we are and ought to be. That, as I conceive, is the relation of the United States to the Pacific Ocean.

President Peary then introduced Mr. William Barclay Parsons, who spoke on the Panama Canal:

When the French Company turned over this canal to the United States Government some nine months ago, and the Commission took possession of it, it was generally expected that active work would be begun in the near future. Unfortunately, that has not been the case. But the nine months that have already gone and the other months which must yet follow before active work can be begun have not and will not be lost. The first French Company undertook to build a canal at sea-level. It finally failed, and a new company came in to take up the work. It had a broken credit and it had a concession whose life was about to expire. It was, therefore, compelled to devise, not the best canal, but to devise a canal that could be built within a certain maximum limit of money and within a very short limit of time.

The United States is not subject to either of those limitations. Unfortunately, we found that the studies of the last French Company (because the first French Company had made very few, if any) had been confessedly toward the thing that I have just described, and it therefore became necessary for this Commission to begin where the French companies were supposed to have begun many years ago, and for the first time make a thorough study of the conditions existing upon the Isthmus. Until the surveys and studies have been completed, until we know more about the geography and geology and the topography of the Isthmus, it is most premature, and, in fact, impossible, to make any statements in regard to the type of the canal. If a canal can be built without locks, so that Capt. Mahan can send his largest battleships, and so that you gentlemen of commerce can send your largest passenger and freight steamers through without the delay of locks, except the tidal lock that will have to be constructed at the Pacific end, obviously that is the best canal that can be built. But in the first place we must determine what that canal is to cost and how long it will take to build it. And when those figures have been obtained, when we have that necessary knowledge to form a judgment, then we shall have to decide whether this Government can afford to pay the bill both in time and in money.

Baron Kaneko, formerly of the Imperial Japanese Cabinet, was then introduced by President Peary. He said in part:

I should like to say a few words in connection with your President's statement that this is the fiftieth anniversary of the founding of your Society. It is a curious

coincidence. This year is the fiftieth anniversary of the first treaty signed by Commodore Perry with the Empire of Japan. So the birth of your Society is connected with the birth of our modern advancement, and it is most delightful to me to have the opportunity to say a few words on behalf of the Japanese Empire. My country and my people owe everything, all their progress and achievement, to the good offices of the United States. So that with whatever laurels of honour we are crowned they were given by you by the making of that treaty just fifty years ago, when you were founding your Society in this great City of New York. . . .

The President introduced Mr. Henry G. Bryant, President of the Philadelphia Geographical Society, who tendered the congratulations of his Society, and continued:

I believe American geographers fully appreciate the large share borne by this Society in entertaining the members attending the recent Geographic Congress, and I think that if that Congress accomplished nothing else it has brought about a better understanding between the Geographical Societies of this country. I believe that every American who attended that Congress in New York took special pride in showing to our distinguished foreign delegates the noble home of this Society, the like of which I have seen nowhere in America or in Europe, and I feel also sure that those strangers, on returning to their homes, will have a full appreciation of the dignity which our science has attained in this Western World. . . .

There are two men who have probably done more to interest me in geography than any others I have met. Both men were Presidents of this Society. I refer to the late Charles P. Daly and Commander Peary—the one the kindly and lovable gentleman and the enthusiastic student of geography, the other the gallant explorer of the Far North.

THE PRESIDENT: Ladies and Gentlemen, this closes the order of exercises for the evening. We bid you God-speed until the next dinner of the American Geographical Society.

THE INVESTIGATION OF ALASKA'S MINERAL WEALTH.*

BY

ALFRED H. BROOKS.

The developments of the last five years have shown that Alaska, as a field for mining, stands in the first rank among the possessions of the United States. Its annual gold output is now about $8,000,000. It produces silver, copper, and coal in commercial

* Published by permission of the Director, U. S. Geological Survey.

Mr. Brooks, who is the Geologist-in-Charge of "The Division of Alaskan Mineral Resources" in the U. S. Geological Survey, read this paper before the American Institute of Mining Engineers at its Lake Superior meeting in September last. It is reproduced here because it is the authoritative presentation of the facts relating to a subject of large public interest. Mr. Brooks's data cover the subject to the close of 1903. To complete the review, readers are referred to "Notes on Topographic Surveys in Alaska, 1904," in the November BULLETIN, pp. 699–701. The accompanying map is based upon that with which Mr. Brooks illustrated his paper. A complete bibliography of the U. S. Geological Survey publications on Alaska, including maps, is printed in *Bulletin* 227 issued by the Survey.—THE EDITOR.

quantities, and its recently-discovered tin and petroleum promise to become important products. Concurrent with the gradual development of this wealth, the mining public has ceased to regard the territory simply as an Arctic province where a few placer-miners struggle with adverse conditions to secure a grub-stake or a modest fortune. Of late years there has been a large influx of capital to investigate its mineral resources, but in its area of nearly 600,000 square miles there still remain large unexploited and little-known fields.

This work of investigation has been carried on under adverse conditions, and reflects credit on all who have shared in it, whether prospectors, mining engineers, or geologists. It is the purpose of this paper to outline briefly what has been and is being accomplished toward furthering the knowledge of Alaska's mineral wealth, and in this connection to present a brief history of the operations of the United States Geological Survey in the Territory. A list of the publications of the Geological Survey which pertain to Alaska will be presented as an appendix, in the hope that it may prove useful to those who are interested in the mining of this northern province.

During the Russian occupation of Alaska, from 1783 to 1866, but little attempt was made to delineate its geographic features or to study its geology and mineral resources. The Russian-American Company, which long held control of the Territory, was entirely absorbed in the exploitation of its fur trade, without concern for its other possibilities. During the last decades of the Russian régime, however, the Fur Company was compelled by Imperial ukase to choose its administrative head from among naval officers, and some of these governors, notably Wrangell and Tebenkof, were men of scientific attainments and interests, under whose administration the finances suffered somewhat, but the cause of exploration was materially advanced by attempts at charting the coastal region, and even by an occasional expedition into the interior. From these surveys, supplemented by the efforts of navigators and explorers of various nationalities—chiefly English—was obtained a fairly complete knowledge of the entire coast-line of Alaska, and some geographic data concerning the lower courses of the Yukon, Kuskokwim, and Copper Rivers. Many of the expeditions included naturalists who made geologic observations and palæontologic collections, which eventually found their way to various scientific institutions of Europe; but, at best, the results were merely fragmentary. It was the policy of the Russian-American Company to

discourage the development of any mining interests within the territory, out of a belief that mining would be inimical to the fur-trading interest. When, however, the administration of the naval governors combined with the decrease of the fur-bearing animals to bring about a diminution of revenues, an abortive search was made for mineral wealth. A mining engineer by the name of Doroshin was dispatched to Sitka in 1848, and spent the succeeding two years in examining the islands thereabouts and in the Cook Inlet region; and he did, in fact, make the first discovery of gold in Alaska. But as the returns from nearly a year's work of some 40 men yielded only a few ounces of placer-gold, obtained near Cook Inlet, he reported adversely as to the presence of gold in commercial quantities, thus terminating the only Russian attempt at gold-mining in Alaska. The current reports of evidences of Russian placer operations in various mining districts have so far proved to be without foundation.

Doroshin did, however, recommend the mining of coal at Cook Inlet, and the demand created by the gold discoveries in California led to the establishment of such an enterprise on Port Graham, in 1852, but without commercial success. The Russians made no other attempt at developing mineral resources, unless the shipment of ice to California, carried on in a desultory manner for some years, can be regarded as such.

The Russian traders had pushed their way a thousand miles up the Yukon, and had explored the lower stretches of the Kuskokwim and Copper Rivers; but previous to 1865 little was known of the interior of what was then called Russian America. In that year it was reported at Sitka that American prospectors had found gold on the Stikine River, and an expedition was dispatched to verify the rumour and establish the International Boundary. With the party went Professor W. P. Blake as geologist, among the first of Americans to investigate the geology of Alaska. From the east the interior had been penetrated by the traders of the Hudson Bay Company, who, following the routes marked out by such explorers as Franklin and Mackenzie, had reached the Yukon in 1849; but they, too, were adverse to the development of mining industries, and made no attempt to investigate mineral resources. In 1865 the Western Union Telegraph Company organized a survey of northwestern America to find a route through Canada to Bering Strait, in order to connect by cable with a line crossing Siberia from Europe. The success of the Atlantic cable led to the abandonment of the project, but the investigations of the scientists and

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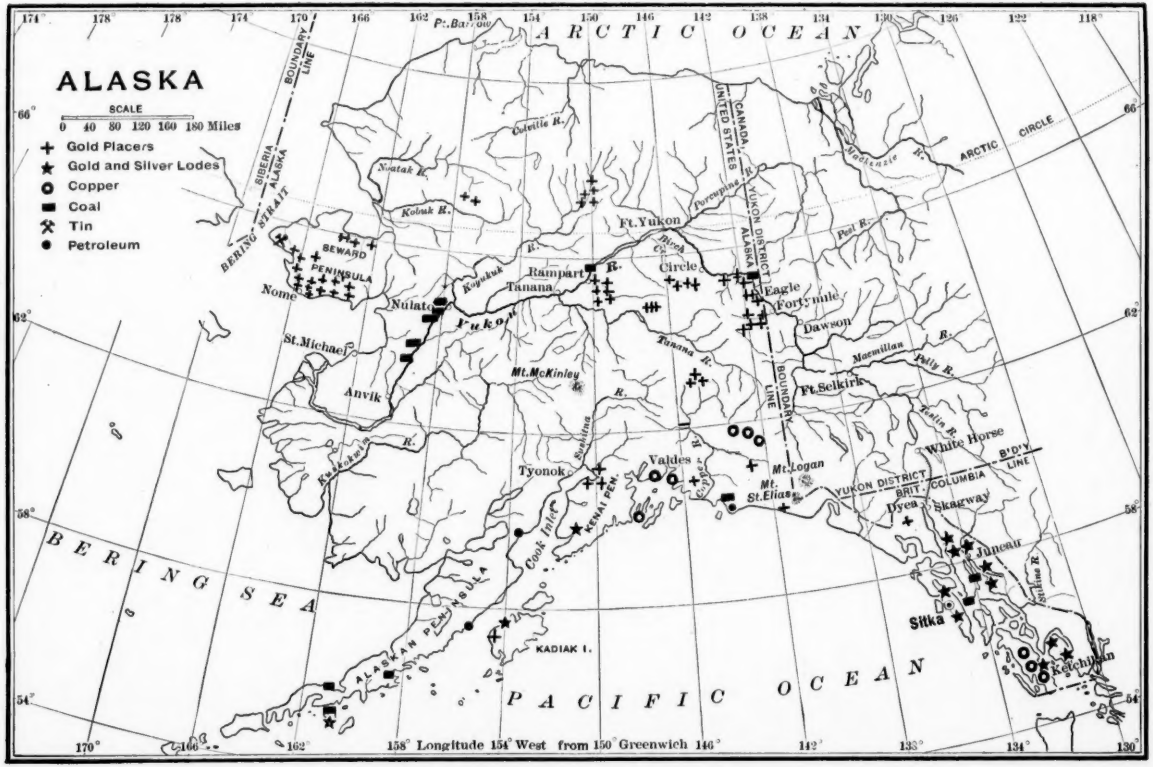

MAP SHOWING MINERAL DEPOSITS IN ALASKA.

explorers of the expedition were of lasting importance; though, except for the work of Dr. Wm. H. Dall, the most prominent member of the parties, they were of solely geographic interest. Dall continued his work in Alaska as a member of the Coast Survey after the transfer of the territory.

In 1866 Russia ceded her North American possessions to the United States for the sum of $7,200,000, and Russian America became Alaska. The interest awakened by the addition of this vast domain was only short-lived among the mass of the American people, the majority of whom regarded it as an Arctic province possessing no value outside of the fur trade. Few, if any, dreamed that this isolated possession was destined to become a great mineral producer, and that in the course of one generation its annual gold output would exceed by over a million dollars the price paid for the entire territory.

The apathy of the public and the neglect of the executive and legislative arms of the Government relegated the new possession to temporary oblivion. For twenty years after Alaska passed under the control of the United States systematic surveys were limited to its coast-line. Explorations in the interior were fostered by the various branches of the Government and by private enterprise, but only intermittently and without definite purpose. Thus, while there developed gradually a somewhat more exact geographic knowledge of our new Territory, no light was thrown on its mineral resources. But while the Government's interest in this virgin field lay dormant it soon attracted the ever-active American prospector. As already noted, he found gold on the Stikine even before the purchase of Alaska. Following this came the discovery of auriferous quartz near Sitka in 1879, and of gold in the Juneau placers in 1880. It was the development of the latter which led to the finding of the gold-bearing lodes that have made Juneau the foremost mining-camp of Alaska. The restless pioneers, soon finding means to overcome the opposition of the natives to the white men's penetrating the interior, made their way across the Chilkoot Pass, and while descending the Lewes River came upon more gold. In 1886 the gold-placers of the Fortymile region were discovered, and the discovery of other districts followed rapidly during the succeeding decade.

These Yukon pioneer miners were dependent entirely upon their own resources, formulated and executed their own laws, and were practically ignored by the Territorial and Federal Governments. It is largely to their perseverance and pluck that the country now owes

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its millions of revenues from the Alaskan placer-fields. Not until 1895 did Congress awake to the importance of examining into Alaska's mineral wealth. In that year $5,000 was appropriated for an investigation of its coal and gold resources by the U. S. Geological Survey; and, small as the sum was—considering that the territory to be investigated was two and one-half times the size of Texas, and that the field of investigation lay two or three weeks' journey from Pacific Coast ports—this was the first organized attempt in this direction.

The party which was sent out spent the summer of 1895 in an extensive examination of the Pacific coastal belt, and accumulated valuable information regarding the distribution of the coal-bearing rocks and the character of the gold deposits.

In the following year a similar appropriation was made, and a party of three was sent inland to study the placer-districts along the Yukon River. This long journey, at a time when few had penetrated to the Yukon gold fields, was accomplished at the expense of considerable hardship, the party succeeding in visiting all of the producing gold-camps of the Yukon, among which were numbered at that time Fortymile, Birch Creek, and Minook districts. The investigation could not be continued in 1897, because the Appropriation Bill failed to pass in time to make the funds available in this distant province. It was the discovery of the Klondike gold-placers in 1896 that opened people's eyes to Alaska's importance, and, as the facts became disseminated during the following two years, public opinion on this point rapidly changed. There was then pressing demand for reliable information about the northwestern part of the continent. This was met on the part of Congress in 1898 by appropriations for various bureaux for Alaskan investigations to be made by the Government; and the amount to be expended by the U. S. Geological Survey for this purpose was increased to $20,000. Under this latter appropriation the U. S. Geological Survey began the series of systematic surveys in Alaska which it has continued to the present time.

The task before it was not an easy one. Here was an area of from 500,000 to 600,000 square miles, of which little but the coast had been surveyed and very large areas were almost unexplored. The province to be investigated was far distant, and the season of operations limited to the summer months. Moreover, the work must be so conducted that the results should be available at the earliest possible date. No plans which required more than one season for their execution could be considered, for there was an

urgent demand on the part of the thousands who were working blindly in this northern region for immediate information. It is plain that these conditions could not be met by planning detailed and final surveys, which, while of the utmost importance to a mining community, must be preceded by explorations and reconnaissances. Moreover, the fact that the work had to be begun within a month from the time the Appropriation Bill passed left little time to formulate plans and organize parties. Fortunately, the U. S. Geological Survey was able to draw on a corps of geologists and topographers who had been trained in other fields for work of this character.

It was decided to send four parties to Alaska—one to map an area lying close to the new Klondike placer-fields, and the others to conduct extensive explorations. One of the latter made a reconnaissance of the Sushitna River valley and crossed the divide to the Cantwell, mapping the topography aud geology as far as the means would permit and determining the position and altitude of Mount McKinley. Something was learned regarding the distribution of the placers in the Sushitna valley, and the source of the gold was traced to small quartz-seams in metamorphic slates.

Another expedition ascended the Skwentna from Cook Inlet, portaged along the Alaskan range to the headwaters of the Kuskokwim, and, following this great river to the sea, then turned eastward, and, partly along the coast and partly inland, made its way back to the Pacific Coast, completing in four months a journey of more than 1,400 miles.

The other party, which was distinctly topographic, made its way inland along the same route and mapped some 2,000 square miles lying chiefly in the placer district of the Fortymile region.

On its way inland, the third party followed the then much-travelled Klondike route as far as the mouth of the White River, ascended that for about 100 miles, then crossed to the waters of the Tanana by portage, and followed that river to its mouth. The report of the topographic and geologic results of this expedition contained suggestions in regard to the distribution of placer-gold which have been verified by the recent discoveries in that field.

In that same year the U. S. Geological Survey was enabled, by the courtesy of the War Department, to assign two of its geologists to accompany army expeditions into the interior of Alaska. The one conducted explorations in the Copper River basin, while the other made its way inland from Cook Inlet.

At the close of the season of 1898 the reports of these different

reconnaissances and exploring expeditions not only increased the geographic knowledge of Alaska, but contained much practical information in regard to routes, trails, and timber, as well as to the geology and mineral resources.

In 1899 the investigation was continued by two expeditions—one across the country from Pyramid Harbour on Lynn Canal to Eagle City on the Yukon; and the other from the Yukon north to the Koyukuk. The first made its way along the northern front of the Saint Elias range, across the headwaters of the White to the Tanana, and, thence turning northward, reached the Yukon by a route through the Fortymile placer-district. On the way a hasty examination was made of the Porcupine placer-district and Fortymile region. What was still more important, it was definitely established that copper occurred in placers at the headwaters of the White and Tanana Rivers; and the metal was traced to its bed-rock source.

The second party ascended the Chandler, a northerly tributary of the Yukon, and, reaching the basin of the Koyukuk by portage, followed that river to its mouth, giving special attention to the little-known placer-fields of the region.

The accompanying map gives the distribution of the mineral products of Alaska as far as is known at present.

Towards the close of the season of 1899, the two parties combined and utilized the few remaining weeks in visiting the newly-discovered gold deposits of Nome, thus gaining material to publish a preliminary report on this important placer-field in the following winter. The wide circulation of this report instances the value of early publication of results.

The increase in gold output of the Seward Peninsula, from $15,000 in 1898 to more than $2,000,000 in 1899, excited an interest which rivalled that shown in the Klondike. From the 20,000 people who went north during the summer of 1900 there arose an urgent demand for topographic surveys and information in regard to the mineral resources of the district. To meet these new developments, the purely exploratory work of the Survey was set aside for the time being, while activities were directed to a real mapping of the newly-discovered fields. About half of the Alaskan forces were concentrated in the Seward Peninsula. These in the course of one season not only completed a contoured map of an area covering more than 6,000 square miles, but made a personal investigation of every placer-district and practically every creek of the southern half of the peninsula; as a result of which a report was issued the

following year, showing the distribution of the gold-bearing gravels, the source of gold and its mode of occurrence. The question of bonanzas in the placers was the subject of special discussion. The theories advanced as to their probable origin have, in most cases, been confirmed by later developments in the region.

The discoveries in this season of workable placers in the high bench, tundra and elevated beach-gravels of the Seward Peninsula furnished further proof of the value of geologic work; for the report of the previous year, in calling attention to these gravel-deposits, then entirely unprospected, had dwelt upon the probability of their being auriferous. A similar instance was the discovery by a member of the Survey of stream-tin in the York region.

In the Copper River region there had been seemingly important discoveries of copper, and an urgent demand came from capitalists, mine owners, and engineers for more authentic data. To meet this demand a large force was dispatched to the new district and an area of some 5,000 square miles was mapped topographically on a scale of 4 miles to the inch. Within this belt a geologic reconnaissance map was made, and the general occurrence of the copper-bearing rocks was determined, while individual prospects were examined as far as possible. The report which resulted from this work was of such a character that mining engineers had definite basis for making preliminary estimates on the cost of railroad construction, as well as considerable data on the probable extension and value of the copper-deposits. The same season a more hasty examination was made of the copper-deposits of Prince William Sound.

In 1901 the work in the Seward Peninsula was extended to the northward by a reconnaissance survey of about 5,000 square miles. Some additional information was obtained regarding the distribution of stream-tin, and considerable areas were examined in sufficient detail to enable a fairly definite statement to be made regarding the presence and absence of placer-gold. A most valuable feature of the work, in the light of after-developments, was the outline of some granite intrusives, for it is along the contact of the sediments and granites that tin-deposits have been discovered.

The same year witnessed very important explorations in northern Alaska. One party, which had to travel 1,200 miles by dog-teams in mid-winter, made a reconnaissance survey from the Yukon northward to the Arctic Ocean, traversing a mountain range which, up to that time, had never been visited by white men, and at the close of the season contrived a hasty examination of the Cape Lis-

burne coal fields. Another survey, carried from the Yukon to Kotzebue Sound, has proved of particular value to the prospector since the discovery of placer-gold within the area surveyed.

During this season the Ketchikan mining district of southeastern Alaska also was subjected to a preliminary examination. Nearly 200 prospects were visited and reported upon, and a geologic reconnaissance map was made of an area covering about 2,000 square miles.

To meet the growing demand for information in regard to the Copper River basin, two parties were sent into this district in 1902. These, besides completing the reconnaissance topographic and geologic mapping of the basin, extended the work both to the north and south. A detailed study was made of the Chistochina gold fields, as well as of the northern copper field, which had received a preliminary examination in 1869.

The growing importance of the Yukon placer-fields and the consequent traffic on the Yukon River had led to a number of only partially successful attempts to mine coal for local use in that field. With the idea of furthering these interests, a party was dispatched to make a special study of the coal. The results showed that there were large areas of coal-bearing rocks on the Yukon, and that while the upper river coals were, for the most part, of lignitic character, some of those along the lower river, which are of a lower geologic horizon, can be graded as semi-bituminous, and should afford a local fuel supply.

Hand in hand with these special geologic investigations, geographic mapping has proceeded by a series of reconnaissance surveys. In 1902 an exploring party made its way from the head of Cook Inlet through the Alaskan range, along its northwestern base to the Tanana River, and thence to the Yukon, completing an 800-mile journey in three months and a half. Yet topographic surveys were maintained throughout, and much was learned of the geology, as well as of the mineral resources. An area of coal outlined on one of the southern forks of the Tanana, though of no immediate importance, has possible future value, for it lies near the route of a proposed railway from Cook Inlet to the Yukon.

The demand in southeastern Alaska, where large capital has been invested in mining-plants, is for detailed geologic and topographic maps. But the great cost of such surveys unfortunately prohibits their extension with the rapidity required by the mining developments. The beginning was made in 1902 by mapping an area of about 80 square miles in the vicinity of Juneau on a scale of one mile to the inch.

With improved transportation facilities, and better organization of the work, came a material decrease in cost, which enabled the U. S. Geological Survey to send seven parties in 1903. To one of these was assigned the task of completing the reconnaissance mapping of the Seward Peninsula, of which there are fairly accurate maps. At the same time an examination of the newly-discovered placer-fields in the northeastern part of the peninsula was made.

The general policy of the Survey is to keep in touch, as far as the appropriations will allow, with all mining interests, and to publish from time to time supplementary reports based upon new data thus obtained. Thus, when the rapid developments in the older districts of the Seward Peninsula created a demand for further geologic investigation, a party was sent to make a tour of nearly all the important mining-camps in the region. An interesting result of this work was the tracing of the tin to its bed-rock source. Though it is too soon to predict commercial importance for this new discovery, yet all indications are sufficiently favourable to stamp this as an excellent example of the importance of scientific investigation in a new mining district and a most striking case of the practical value of geologic work.

While every effort has been made to keep abreast with conditions in the more important mining-camps in Alaska, at the same time the lesser ones have not been neglected. The Yukon placer-fields have been steadily developing, though at a much slower pace than those in the Seward Peninsula. To meet the great demand for accurate maps and information, two parties were sent into the Yukon country in 1903—one for a topographic survey extending from Eagle City to the Fairbanks district and thence northward to Circle City, and the other to subject the placer-fields of the Forty-mile and Birch Creek regions to a re-examination, and also make some preliminary studies in the newly-discovered Fairbanks district.

The work of the previous year had thrown some light upon the occurrence of the coal on the Yukon, but important stratigraphic problems still remained to be solved, which, while they had no immediate economic value, were still of sufficient practical importance to deserve a share in an investigation of the mineral resources. With this in view another party was sent down the Yukon in 1903, which obtained still more evidence in regard to the age and distribution of the coal.

Mention has been made of the detailed topographic survey of

the region lying adjacent to Juneau. This district came in for geologic investigation in 1903, and the reconnaissance mapping was continued over an additional area extending from Port Houghton to the Porcupine gold-district. The former received a detailed examination, and by careful study of its important mines the relations of the ore-bodies were determined and important conclusions reached in regard to their distribution.

While the interest in Alaska centres chiefly in its placer-mines, yet during the past three years considerable prospecting for petroleum has gone on. The successful boring of a well in the Controller Bay region and the favourable indications in the Alaska Peninsula led the U. S. Geological Survey to dispatch a party in 1903 to make a preliminary examination. Reconnaissance surveys in the Controller Bay region and in the oil fields of Enochkin and Cold Bays on the Alaska Peninsula yielded much data as to the geologic conditions of the petroleum distribution. While these studies were only preliminary and cannot be considered conclusive, they at least show that these districts give promise of producing oil and that drilling wells can be considered a legitimate operation. Furthermore, it was definitely ascertained that there are workable coal-seams of a semi-anthracitic character in the neighbourhood of Controller Bay. As this coal is of the highest grade yet found on the Pacific Coast, it promises, in spite of the somewhat adverse conditions for shipping, to become an important resource of the Territory.

In the foregoing an attempt has been made to outline briefly the character of the work which has been performed for the investigation of Alaska's mineral resources. While it is believed that the results are of practical value—a view which is borne out by the strong support that the U. S. Geological Survey has received from the mining men of Alaska—yet it is only too evident that much remains to be done, and that all of the investigations so far are only preliminary. It will be many years before exhaustive studies can be made, such as are now being carried on in many of the mining districts of the United States.

In July, 1903, the Alaskan surveys, which had been at first a subordinate function of the geologic and topographic branches of the U. S. Geological Survey, were organized as a distinct division, entitled "The Division of Alaskan Mineral Resources," and its administration was vested in a Geologist-in-Charge. The force of workers, which in 1899 numbered only two geologists and two topographers, now includes ten geologists with two assistants and

three topographers with three assistants, besides an additional field force of some thirty men.

It is difficult at the present day to conceive how little was known of Alaska previous to 1898. The expeditions of earlier years had contributed something to the knowledge of the country drained by the Yukon, and more or less indefinite information was available in regard to a few other parts of Alaska, but the country as a whole was practically unknown. Many of the most important geographic features have been added to the map by the reconnaissance and exploration surveys of the years from 1898 to 1903, during which the principal mountain ranges have been outlined and the drainage areas defined.

A most important function of the Alaskan surveys has been the production of contoured maps, the value of which cannot be overestimated. There are demands for them from prospectors, engineers, and capitalists, who find in them an essential aid toward the development of the country along any line. They indicate routes of travel to the prospector and explorer, railway and wagon routes to the locating engineer, and possible sources of water supply to the mine operator. During the six years that systematic work has been carried on an area of between 90,000 and 100,000 square miles has been covered, representing about one-sixth of the total area of Alaska.

While the aim of the work has been to investigate mineral resources, this has, of course, necessitated geologic studies, for it is only through the medium of a thorough geologic knowledge that the facts gathered in regard to the value and distribution of ore-deposits can be practically and scientifically interpreted. From year to year this fundamental knowledge is growing, and in the course of time the geologic history of the Territory will be deciphered. In fact, much is already known of the general succession and distribution of the many bed-rock formations.

The studies of the bed-rock geology contributed by each expedition are resulting in an accumulation of material which becomes increasingly valuable in tracing the distribution and origin of deposits having economic importance. The occurrence of such deposits is but a minor feature of the general geology, but the most important factor in the development of the country. The Survey's function is to study the relation of the two, and, in the course of the studies, results have often been achieved of immediate practical importance to the people of Alaska.

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In the preceding paragraphs of this paper reference has been made to the various classes of economic investigations which have been carried on in Alaska. This work is but fairly begun, for nearly all of the examinations have been of a most hasty and preliminary character. It has been the aim to establish general relations, and to give the mining public the benefit of these by early publication of reports, leaving detailed studies to future years, when developments will prove such as to warrant their cost. By pursuing this policy the Survey in the course of the past six years has been able to obtain some information from every mining-camp in Alaska, and this has, for the most part, been promptly published and widely disseminated. Recently Congress has manifested its interest in Alaskan mining affairs by increasing the appropriation for investigation of the mineral resources to $80,000. This sum will make it possible to push the work at a pace more commensurate with its importance. The Survey's aim will be to keep abreast, if not in advance, of mining developments.

The large investments made in water-supply ditches, pumping plants, and mining machinery in the Seward Peninsula have shown the need of detailed surveys in this field. Though mine operators have many times been witnesses to the value of the present reconnaissance map, the magnitude of the mining operations now necessitates a demand for detailed maps*. Surveys for this will cost from five to ten times as much as the preliminary ones, but when completed will give the mine operator a thoroughly reliable basis for his engineering work. While this will constitute the only immediate value of the contoural maps, yet they will prove of no less importance as a base for detailed geologic studies. These latter will not only determine the distribution of placer-gold, but will throw light on the much-mooted question as to the presence or absence of commercially valuable auriferous veins. There is a like demand for surveys in the Yukon placer-field, but, here, developments have not yet advanced so far as to outstrip the usefulness of reconnaissance maps. These should, however, be pushed to early completion ; after which should follow detailed mapping of areas containing placers which prove to be of high commercial value.

In the Cook Inlet placers the surveyor may see another field which demands attention. It has been the scene of such mining activity as to warrant topographic and geologic surveys, but be-

* This demand was partly met by the Surveys of 1904. See BULL. A. G. S., p. 700, Nov., 1904.

cause of the urgency of other work it has, up to the present time, been almost neglected.

Because of the great cost involved, the progress of detailed surveys in southeastern Alaska must of necessity be rather slow; but it will be possible within the course of a few seasons to complete the reconnaissance mapping. This, in conjunction with a preliminary study of the occurrence and association of the ore-bearing horizons, should yield results of value to the prospectors.

The heavy capital which is being invested in the oil fields on the Pacific coast of Alaska singles this out also as a region needing further attention. Hand in hand can go a study of the coal fields of this district, which give promise of large commercial importance.

The above suggestions do not by any means exhaust the possibilities for effective geologic and topographic work, but will indicate the lines along which there is the most pressing demand.

GEOGRAPHICAL RECORD.

AMERICAN GEOGRAPHICAL SOCIETY.

TRANSACTIONS OF THE SOCIETY, NOVEMBER–DECEMBER, 1904.—A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, November 22, 1904, at 8.30 o'clock P.M.

President Peary in the chair.

The following persons, recommended by the Council, were elected Fellows:

P. J. Goodhart.
George A. Plimpton.
Mrs. Roswell D. Hitchcock.
Grant Squires.
Frank Benedict Cleland.
Mort J. Kaufman.
John D. W. Sterry.
John F. Doyle.
Sidney Bradford.
H. C. Chatfield-Taylor.
George S. Brewster.
Francis J. Arend.
George Coe Graves.
Samuel M. Bain.
William T. Gade.
Robert Garrett.
Carl A. Hansman.
A. G. Baker.
Otto Quelle.
F. W. Bruggerhof.
Basil H. Soulsby.
Andrew Carnegie.
William L. Brown.
Ernest W. Bowditch.
Daniel Moreau Barringer.
Gen. Francis Fessenden.
Alfred G. Hoe.
C. Heurich.
Durbin Horne.
William Gammell.
Bernard G. Gunther.
Charles J. Glidden.
C. F. Adae.
Anthony Dey.
Charles W. Iden.

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The President expressed his gratification at the number of new Fellows elected, and hoped that all would lend their aid to add new names to the list.

Mr. Oscar T. Crosby was then introduced and addressed the Society on his journey in Turkestan and a Corner of Tibet.

Stereopticon views were shown.

On motion, the Society adjourned.

A Regular Meeting of the Society was held at Mendelssohn Hall, No. 119 West Fortieth Street, on Tuesday, December 20, 1904, at 8.30 o'clock P.M.

President Peary in the chair.

The following persons, recommended by the Council, were elected Fellows:

Glen E. Balch.
Alfred Crane.
Andrew F. Derr.
Horace M. Bellows.
Selmar Hess.
Mrs. Frederick F. Thompson.
Arthur C. Bradley.
George Herbert Beaman.
Arthur B. Emmons.
Dr. Herman Knapp.
James Roosevelt Lathrop.
George A. Strong.
Henry Spencer Blackmore.
Emil S. Levi.
E. A. Hitchcock.
Henry Stockbridge.
E. T. Bragaw.
Stephen Bonsal.
Anson Phelps Stokes.
S. M. Dix.
Joseph Holland.
W. Nephew King.
F. Robert Mager.
A. L. A. Himmelwright.
William E. Chancellor.
W. B. Lawrence.
J. H. Mergentine.
Joseph G. Myers.
Charles C. Mellor.
Charles E. Sampson.
Temple Bowdoin.
S. Bookman.
Louis Haupt.
Henry B. Bigelow.
John B. Jackson.
William Travers Gray.
Henry Cabot Lodge.
G. M. Laughlin.
Horace H. Fritz.
Clement Brown.
Alfred H. Brooks.
Thomas M. Carnegie.
John Bassett Moore.
Mrs. Charles C. Beaman.
John B. Marcou.
Robert N. Kenyon.
Hyman Starr.
Dwight Braman.
Robert G. Eccles.
Arthur M. Edwards.
Charles Henry Fish.
Frederick G. Agens.
William T. Meredith.
J. Jungmann.
Louis V. Holzmaister.

The President then introduced Mr. Alfred H. Brooks, who addressed the Society on the Geography and Resources of Alaska.

Stereopticon views were shown.

On motion, the Society adjourned.

THE FIFTIETH ANNIVERSARY of the Incorporation of the Society was commemorated by a dinner at Delmonico's restaurant on the 21st of December, 1904.

The proceedings at the dinner are recorded in this BULLETIN, pp. 22–26.

AMERICA.

THE ASSOCIATION OF AMERICAN GEOGRAPHERS.—This Association was organized at a meeting in Philadelphia on Thursday, Dec. 29. The meeting was held in the University of Pennsylvania. The constitution adopted specifies as the objects of the Association,

> the cultivation of the scientific study of geography in all its branches, especially by promoting acquaintance, intercourse and discussion among its members, by encouraging and aiding geographical exploration and research, by assisting the publication of geographical essays, by developing better conditions for the study of geography in schools, colleges, and universities, and by co-operating with other Societies in the development of an intelligent interest in geography among the people of North America.

The membership is limited to persons who have done original work in some branch of geography. The following officers were elected for the first year:

President, W. M. Davis; Vice-Presidents, G. K. Gilbert and A. Heilprin; Secretary and Treasurer, A. P. Brigham; Councillors, Cyrus C. Adams, H. C. Cowles and R. S. Tarr.

After the organization was completed, about twenty papers were read by members, including W. M. Davis, A. P. Brigham, Bailey Willis, R. S. Tarr, R. E. Dodge, E. Huntington, H. C. Cowles and others.

The Association starts with a membership of about fifty working geographers of North America. The departments of physiography, exploration, meteorology, oceanography, biology (including zoological distribution and anthropogeography), and educational and historical geography are thus far included. It is not intended that the Association shall merely add another to the list of geographical societies; it is believed that the geographers of North America, through such an organization as this, which will facilitate their acquaintance and intercourse and thus make mutual co-operation more convenient and feasible, should become a very helpful influence in behalf of the geographical interests of the continent. Practical efforts looking towards the provision of more accurate and effective "Helps for Teachers of Geography," the improvement of map-making and other phases of work, were suggested. A programme on these lines of effort will require hard work, but there is no doubt that the Association will be very useful and successful if it is able to stimulate interest and to organize effort in behalf of a better understanding of geography among the people of the continent.

GLACIAL AND POST-GLACIAL HISTORY OF THE HUDSON-CHAMPLAIN VALLEYS.—In recent numbers of the *Journal of Geology* (Vol. XII, 1904, pp. 415–469 and 617–660), Prof. C. E. Peet presents a detailed statement of observation and interpretations relating to the glacial and immediately post-glacial history of the Hudson-Champlain valleys. Many local features are described and their interpretation discussed. These features include the several moraines, kame areas, deltas, lake clays, and marine deposits. It is a large area and a large subject and much painstaking work will be needed all the way from New York City to the St. Lawrence before its detailed history can be satisfactorily worked out. This is the first elaborate attempt at a broad discussion of the general features; and, considering the size and intricacy of the problem, Prof. Peet has done an exceedingly creditable piece of work. It abounds in local details to such an extent that it does not seem wise to attempt an abstract, but merely to call attention to the existence of the paper. R. S. T.

DESCRIPTIONS OF MARYLAND.—The Johns Hopkins University Studies (series XXII, No. 11–12) gather together brief descriptions of Maryland, found in the works

of travellers and in guide books, with references to a chronological bibliography of these sources filling 58 pages. An index of authors concludes the work. No claim for completeness is made for the list of books, but it should prove useful to those interested in the State's history and to students of local conditions, manners, and customs.

U. S. NAVAL WIRELESS TELEGRAPH SERVICE.—The Pilot Chart of the North Atlantic for December announces that the facilities of the naval coastwise wireless telegraph stations, where not in competition with private wireless stations, are placed at the service of the public, and particularly of maritime interests, for the purpose of reporting vessels, maritime casualties, and derelicts at sea, for receiving private or commercial telegrams from ships at sea for further transmission by wire, and for sending wireless telegrams to ships at sea. For the present this service will be rendered free, but all messages will be subject to the tariffs of the ship stations and land lines. The Government now has 11 wireless stations on the Atlantic coast, 2 on the Pacific coast, and stations also at San Juan, Porto Rico, and Culebra, W. I. It is expected in a few weeks to have 4 more stations on the Atlantic coast, 1 on the Pacific coast, 2 in Porto Rico, 1 at Guantanamo, Cuba, and 1 in the Panama Canal zone.

SNOW AND RAILROADS IN THE SIERRA NEVADA.—In the BULLETIN for June, 1903, pp. 269–270, mention was made of the climatic difficulties met with in the construction and operation of railroads in different parts of the world. As a supplement to those notes, reference may here be made to a recent article in the *Scientific American*, in which emphasis is laid on the great hindrance to railroad operation resulting from the deep winter snows in the Sierra Nevada Mountains and to the various devices by which human ingenuity has endeavoured to overcome the obstacles which nature has put in man's way.

The snowsheds on the Central Pacific Railroad were first built with steel roofs, and in sections, somewhat similar to those of an ordinary house, but it was found that the unbalanced weight of the snow on one side or the other caused continual trouble by throwing the sheds out of line downhill. The sheds were next anchored back to the side of the hill with heavy rods attached to the framework of the shed, and secured to the rock or earth of the cut. It was then found that the snow melted from beneath the rods, and on the adjacent ground and roof of the shed, so that the entire mass for many feet in depth would hang upon the rods, bending them down, and pulling the sheds toward the bank, throwing them out of line in a direction opposite to that which occurred when there were no rods. A further development was the extension of the roof, where practicable, into the adjacent banks, forming a shed which prevented the wedge of snow from piling in between the building and the bank. The success of this form of shed suggested the present typical shape, which has a flat roof, the top of the shed being somewhat wider than the bottom, so that the melting wedge of snow falls away from the side of the shed instead of pressing against it, and so that the weight upon the base is increased, to prevent overturning. This form of roof naturally came closer to the stacks of the engines and increased the liability from fire in the dry season. Deflectors are therefore attached to the smokestack, and these throw the sparks to the sides, instead of straight up against the roof.

On the Central Pacific Railroad there are thirty miles of continuous snowsheds which, with others in isolated spots, bring the total up to about thirty-three miles. Near the summit of the Sierra Nevada, in addition to snowdrifts, there are avalanches containing rocks, trees, etc., which are carried along with the sliding snow. Against

these the snowplough is of no avail, and it therefore seems impracticable to dispense with the snowsheds in this section of the country, in which the snow lies upon the ground in some years from November till June. The stretch of road subject to such conditions covers a distance of thirty-three miles, lying about equally on each side of a station at the summit of the Sierra Nevada Mountains on the Central Pacific Railroad. To guard against fires, a system of watchmen, connected with one another and with various intermediate points by telephone, and an alarm signal system, have been devised. Watchmen are stationed day and night at seven lookout stations. From one of these nearly the entire line of sheds is visible. Three fire trains (and a fourth during the driest part of the summer) always have steam up and crews at hand. Each train consists of a locomotive, fire-fighting brigade, and water cars, which can reach any point within a very few minutes and extinguish a fire without much difficulty. During a recent summer, the total loss through fire was not over $100; but occasionally the fire gets under way and destroys some miles of shed before it can be stopped. In such cases, the only effectual way to stop a fire is to tear down a gap of from fifty to one hundred feet in length. This prevents the remainder of the shed from acting as a chimney and drawing the flame along, as it does when uninterrupted, with great velocity, the heat being so intense that it destroys not only the rails, but the ties buried in the ballast.

The recurrence of these fires, with the resulting loss of property and delay to traffic, suggested the idea, on the Southern Pacific Railroad, of having gaps at intervals along the line which can be closed before the winter storms set in. The gaps or telescopic sheds consist of sections 50 feet long, and sometimes two sections 50 feet long, of movable sheds running on wheels on a track having a gauge of 16 feet 8 inches, the roads being supported on sills outside the ballast line of the main track. These telescoping pieces are arranged to run inside a section at one or both ends of the gap, built larger for that purpose. During the winter, the sections are closed, and the shed is then continuous and of practically the usual construction. As soon as the snow has ceased falling for the winter, the braces are removed and the telescopic shed is slid into the adjacent large section. These movable or telescopic sheds are intended to be placed at distances of from 2,000 feet to a half-mile apart in places favourable to their location. The Southern Pacific Company now has some sixteen of these telescopic snowshed sections, and so far they have proved successful in stopping the progress of large fires. R. DEC. W.

MOUNTAIN BREEZES IN KERN COUNTY, CALIFORNIA.—In the October issue of *Climate and Crops: California Section*, the voluntary observer at Isabella, in Kern County, Southern California, notes the occurrence of descending mountain winds at night, and the effect of these winds upon vegetation. A rapid descent of air, as in the *foehn* or *chinook*, usually brings a rise of temperature, and this is also the case with winds which blow with considerable velocity down mountain sides and valley bottoms at night. On the other hand, if such currents descend slowly, they are cooled by radiation and conduction to the cold ground more than they are warmed adiabatically. Hence they come down as cool breezes. In the case referred to in California, it is obvious that the descent is rapid, for the account says that these winds have "sufficient force to give a temperature in clear weather during winter 11° warmer" at Isabella than at a neighbouring station, Visalia. The observer notes that he has a vine on his porch which has remained green summer and winter for many years, but that the descending wind fails to reach Visalia, and from there on to Tulare Lake there are heavy frosts in winter. R. DEC. W.

MORE MEN THAN WOMEN.—The proportion of the sexes in the United States is discussed in Bulletin 14 of the Bureau of the Census. It says that in the continental United States there are 1,638,321 more males than females, or about 2 in every 100 persons. The relative excess of males here is greater than the average for all countries. Europe has an excess of females. Every other continent, so far as known, had an excess of males. Probably in the whole world, and certainly in that half of it which has been counted, with distinction of sex, there are several million more males than females. As a rule, sparsely-settled regions have an excess of males and densely-settled regions an excess of females. American cities as a rule have more females than males. In the 1861 cities, each having in 1900 at least 2,500 inhabitants, there were 201,959 more females than males, although many Western cities contain more males than females. The fact that the cities of the eastern United States and western Europe have an excess of females is due mainly to the greater opportunity for women to find employment in those cities. Notwithstanding the great excess of males in the total population of the United States, there are two periods of life when the reported number of females is greater. One, extending from about 83 years of age to the end of life, is probably due mainly to the longer average life of women; the other, from 16 to 25, is perhaps apparent rather than real, and due mainly to the greater number of women who claim erroneously to belong to this age.

THE SIERRA MADRE, MEXICO.—Dr. O. C. Farrington prints in the Field Columbian Museum Publication No. 89, 1904, some interesting observations made in the Sierra Madre, west of Durango, in 1896. The region, though possessing a climate which is not especially unfavourable, is so rugged in topography that it is practically uninhabited. Although seven railroads have western terminals north of the Isthmus of Tehuantepec, not one has crossed the Sierra Madre to the west coast. Of course the topographic barriers are not so great as absolutely to prevent railroad construction, but added to the ruggedness is the fact that absence of good harbours and the very narrow strip of low land along the west coast do not invite the building of roads. That the unfavourable condition affected savage as well as civilized man is indicated by the fact that Lumholtz has searched unsuccessfully for traces of a former population in this region. It contains some resources, especially forests and minerals, but the exact extent of the latter is as yet unknown because of lack of exploration.

Farrington describes the Cerro de Mercado, or Iron Mountain, at Durango, and gives some interesting points regarding the geology and physiography of the section traversed. One of the most striking topographic features observed was the Ciudad de Rocas, or City of Rocks, a peculiar erosional form resembling the erosion in the Bad Lands. Instead, however, of pinnacles, peaks, ridges, and angular outlines, the sculptured rocks were domed and rounded. There is a marked absence of joint planes in the homogeneous rhyolite and almost no talus at the base of the domes, so that the forms are wholly those of rock sculpturing in rock of remarkably uniform texture. There are occasional other horizontal beds of weaker rock, whose more rapid weathering introduces some irregularity into the general dome structure.

R. S. T.

AFRICA,

PROGRESS IN THE ANGLO-EGYPTIAN SUDAN.—Not five years have elapsed since the Mahdist rule in the Egyptian Sudan was overthrown and the rebuilding of Khartum, the old capital, was taken in hand. Its site was then only a labyrinth

of tumbled ruins, of mud houses and huts. The London *Times* reports that great progress has been made in rebuilding the city. Practically the whole river front is now occupied by buildings. The large palace is the central feature, and near it are the spacious Government offices. Along the river front are workshops, a hospital, a fine hotel, residences standing in pretty gardens, the Gordon College, and the cool and comfortable barracks of the British regiment. It was thought at one time that the native population of Omdurman, the capital of the Mahdists, would follow the official class across the river to Khartum. There are now about 50,000 of them in Omdurman, but they are very happy where they are, and it is realized that it is better for them to remain in their present home.

The building of a railroad to connect Khartum with the Red Sea has begun from both ends. About thirty miles of track have been laid from the Atbara River, and work is in full swing from the Red Sea port of Suakin. The distance by steam transport between the Mediterranean and Khartum is 1,500 miles, of which 1,300 miles are by rail and 200 by water. When the railroad is finished between Suakin and the confluence of the Atbara with the Nile, 470 miles of steam routes will connect Khartum with the sea. This will greatly reduce the cost of transportation between the Mediterranean and Khartum and the Upper Nile.

ERITREA'S NEW CAPITAL.—The Government offices of the Italian colony of Eritrea have long been centred at Massowa on the Red Sea. They are now to be removed to the high plateau of the hinterland on account of the very trying climatic conditions at Massowa. The Government has adopted the suggestion of Mr. Ferdinand Martini, Governor of the colony since 1897, to transfer the capital to Asmara, sixty miles in the interior and forty-two miles from Macatat, the present inland terminus of the railroad. In 1897, when the Italians first occupied Asmara, it contained only a few scores of huts and an Abyssinian fort. The town now has a population of 9,000, including about 1,000 Europeans, all Italians excepting a few Greeks and some Norwegian missionaries. It has some aspects of European towns, with a few superior dwellings, cafés, a theatre, a casino, a hotel, a post office, and handsome public and private gardens. It is situated only a mile and a half from the edge of the plateau, is in the midst of splendid pastures, and around it flourish many varieties of trees and some European crops.

None of the typical tropical diseases has a foothold in Asmara, which is 7,800 feet above the sea, with a maximum temperature of 88° F., and a minimum of about 14°. The town is reached from the end of the railroad by a remarkable wagon road built by the Italians in 1900–01. The road is 42 miles long, winds from terrace to terrace, through deep cuts and numerous tunnels, is wide enough for wagons to pass one another, and is rendered safe at its outer edge by a barrier of timbers. Stages run over the road, the fare to Asmara being $5. Italy expects ultimately to extend the railroad to Asmara, but, as the cost will be enormous, the enterprise may not be carried out for years.—(*À Travers Le Monde*, Nov. 26, 1904.)

AÏN SEFRA DESTROYED BY A FLOOD.—The *Bulletin* of the Comité de L'Afrique Française (No. 11, 1904), says that on Oct. 21 the village of Aïn Sefra, in southern Algeria on the edge of the Sahara, was suddenly overwhelmed by torrents which swept down two wadys. The flood was due to heavy rain that had fallen on the slope of a neighbouring mountain range. The inhabitants had no time to escape the rush of waters. Ten Europeans and fifteen natives were drowned in spite of the heroic efforts of the officers and soldiers of the garrison to save life. Among the

victims was Mrs. Isabelle Eberhardt, a writer of reputation, who was collecting material for a work concerning family life among the Mohammedans. It is surprising that the loss of life was not greater, for only about a dozen of the 200 or 300 houses in the village remained. The flood subsided in about ten minutes after reaching the town.

This disaster recalls another of the same kind which occurred in the Algerian Sahara on the evening of April 12, 1899, near Berrian, 300 miles south of the City of Algiers. A force of 90 French soldiers had camped in the usually dry bed of the Wady Urirlu. The stony bed of the Wady is depressed only a few inches below the flat surface of the region. A cloud-burst occurred among the hills to the west, and a few minutes after an alarm was raised an area about three-fifths of a mile across was under six feet of water. Most of the soldiers reached neighbouring hillocks, but the bodies of six of them were found next day several miles below the spot where camp had been pitched.—(BULLETIN, 1899, p. 375.)

These catastrophes show that although rains are comparatively rare in the Sahara, local storms with heavy precipitation sometimes occur, causing floods that bring disaster.

NEW AFRICAN EXPEDITION.—Major Powell Cotton left London for Khartum in November for another expedition in Africa. The object of the journey, which it is expected will occupy about eighteen months, is the exploration of the vast region lying between the Nile and the Zambezi. The expedition will go up the White Nile to Lado, and then strike south through the East side of the great forest, probably visiting the western slopes of Ruwenzori. After investigating the forest and the district to the west of Lake Kivu, the region to the west of Tanganyika will be traversed, and the expedition will then proceed south toward Katanga. Eventually, Major Cotton hopes to come out in British territory in Nyasaland, whence he will travel to the coast by the Zambezi. Every facility will be given to Major Cotton by the Belgian Government, and he will traverse the entire length of the Congo State. Among the special objects of the expedition are the study of the great mammals of the forest region, and also the native tribes, especially the pygmies. A considerable part of the region to be traversed is quite unknown, so it may be hoped that the expedition will make additions to geographical knowledge.

FOUREAU'S MAP OF HIS TRANS-SAHARAN JOURNEY.—The Foureau-Lamy expedition between Algeria and the Congo, in 1898–1900, was the largest scientific party that has crossed the Sahara. Since his return to France, Mr. Foureau has been collating the geographical material he collected, and has produced a fine map, in 16 sheets, which has now been published by the Société de Géographie in the form of an atlas. Twelve sheets, showing the itinerary of the mission from Wargla in the Algerian Sahara to Bangui in the French Congo, on the Ubangi river, are on the scale of 1:400,000, or 6.3 statute miles to an inch. The remaining four sheets are given to a detailed survey of the course at low water of the Shari, between Fort Lamy and Fort Archambault, on a scale of 1:100,000, or 1.5 statute miles to an inch. As all the surveys of this expedition were made with the best instruments and by the most scientific methods, the map gives an accurate idea of the topography along the entire route. The projection adopted was the modified Flamsteed, the central meridian being 10° east of Paris, which nearly coincides with the mean axis of the itinerary. In the margin of each sheet are insets and plans of the most interesting points. This map will be one of the bases for the construction of a detailed map of the Sahara, materials for which the French are now collecting.

FULANI RULERS IN NORTHERN NIGERIA.—Since the occupancy of Sokoto and Kano by the British, the newspapers have frequently spoken of "the downfall of Fulani rule." Major J. A. Burdon, Resident of the Sokoto Province, says in the *Geographical Journal* (Dec. 1904) that though this is true, inasmuch as the Fulani Emirs now have to acknowledge a superior, the expression is misleading. The Fulani Emirs still rule, collect taxes and administer justice. The people have to obey their old rulers, and therefore it cannot be said that the Emirates have fallen. What has happened is that a Suzerain power now guides the rulers, and above them is a supreme court of appeal. The Fulani States, therefore, have not ceased to exist, but have become self-governed portions of a great empire. The feeling of many of the population is one of gratitude, because the peace established by the British has enabled them to return to their long desolate homes, and has freed traders from pillage and extortion. This feeling pervades individuals and individual communities, and will increase till it permeates the whole country. No doubt, however, there is still among many an underlying feeling of resentment. The aim of the British administration is to rule through the existing chiefs and to enlist them on their side in the work of progress and good government.

TRAVEL IN LIBERIA.—The October number of the Monthly Consular Reports contains interesting material on Liberia. Minister Lyon at Monrovia says that beside there being no railroads to further travel, there are no roads for vehicles of any kind, leading into the interior. Beasts for transport are very rare. Human porters are the most serviceable, even for human freight. The traveller is swung in a hammock suspended from a horizontal bar laid across the shoulders of two natives, who rush at break-neck speed through narrow, uneven paths, over dangerous ravines and huge logs which block the way. Except the soldiers and the traders, the coast Liberians are absolutely ignorant of their country. Roads are crooked and even labyrinthine, made so to mislead the enemy in tribal wars. A native never clears paths. If trees fall across them he goes around or climbs over. Bridges are almost unknown, because the natives prefer to swim the streams. Even the more important inland commercial centres are only approached over such roads. It seems strange that neither the State nor foreign enterprise is building roads, to lay the foundations for Liberia's commercial development and secure the perpetuation of her independence. On account of the lack of roads to the coast, the trade is being drawn off northward through French territory. Besides the ordinary climatic and physiographic difficulties in the way of these improvements, the natives themselves are often engaged in inter-tribal warfare, and they object to having roads built to their towns, because a road opens the way for attack.

Minister Lyon also discusses the natives—the Kroomen, the civilized coast negroes, and the barbarians of the interior. He notes their occupations—agriculture, grazing, lumbering and mining, and their resources—good soils, excellent tropical climate, extensive forests, numerous native plants of value, and a considerable variety of minerals. He considers currency, exports, imports, elements of trade and banking; then points out opportunities for growth of trade and obstacles in the way, including laws and regulations. He comes to the conclusion that Liberia is a country of notable natural resources in many lines, and that the greatest obstacles to her development are internal. More complete control of the natives, more stable government, and insured protection, modification of laws relating to foreign occupation, industry and labor, and the making of roads are among the present positive demands for the substructure of national development. G. D. H.

OSCILLATIONS IN THE LEVEL OF VICTORIA NYANZA.—As in all inland bodies of water the level of Victoria Nyanza varies from time to time with more or less regularity. Capt. H. G. Lyons, director of the General Survey Department of Egypt, has just reported the facts thus far ascertained ("On the Variations of Level of Lake Victoria," Cairo, 1904). The annual oscillation of the lake level varies between 1 and 3 feet, while the absolute range during the last seven years has been 3 feet 9 inches.

THE CENSUS OF BRITISH SOUTH AFRICA.—The results of the census of the various South African Colonies carried out early this year have been presented to Parliament. The general totals for the respective colonies and protectorates are as follows:

	WHITES.	COLOURED.	TOTAL.
Cape Colony	580,380	1,825,172	2,405,552
Transvaal and Swaziland	300,225	1,053,975	1,354,200
Orange River Colony	143,419	241,626	385,045
Southern Rhodesia	12,623	—	—
Natal	97,109	187,582*	284,691*

* Exclusive of native areas.

ASIA.

EXPEDITION TO INNER ASIA.—Mr. Robert L. Barrett has planned an expedition to Central Asia which will occupy about two years. He will defray the entire cost of the enterprise, and Mr. Ellsworth Huntington, already known for his remarkable journey through the great cañon of the Euphrates River and his geographical work in Persia, will share his labours. They expect to reach India about the end of February. From Bombay they will go directly north to Kashmir, where they expect to spend two or three months in studying the southern tribes of the Himalayas, giving special attention to evidences of recent glaciation, or other climatic changes. As soon as possible they will enter the high mountains, crossing the Indus at Leh, and entering the great plateau of western Tibet. After gaining some idea of its structure, they will descend into Chinese Turkistan on the north, and will spend there the remainder of the season of 1905.

The chief points of study will be the history of the basins of Central Asia during recent geologic times, and the changes which have taken place since the occupation of the country by man.

During the winter of 1905–6 the explorers will live for two or three months in Kashgar, and expect then to travel along the northern border of Chinese Turkistan to the Turfan depression, Lop Nor, and Kuku Nor. Thence they will proceed southward to the sea, if time allows and circumstances permit; otherwise they will travel east through China to Peking.

In addition to physiographic studies, in which Mr. Barrett is chiefly interested, Mr. Huntington will undertake investigations of the relation of physiography to life, and especially to human life and history. The expedition is under the auspices of the Association of American Geographers.

AUSTRALIA.

NEWSPAPER WEATHER MAP IN AUSTRALIA.—It has for some time been the practice of a few daily newspapers in Europe and in the United States to print reduced copies of the daily weather maps. This practice, which is an excellent one,

brings before a large number of persons the most important facts shown on the full-size chart, but so far few newspapers have been willing to give up the space needed for the map. It is encouraging to receive a copy of the Sydney (New South Wales) *Daily Telegraph* of October 12, 1904, which contains the first daily weather map ever published in an Australian newspaper. The map shows isobars, winds and rainfall; is prepared from information furnished by Mr. H. A. Hunt, Acting Meteorologist of the State, and is to be published daily at the request of many correspondents of the paper, especially of many school teachers. Meteorology has recently been incorporated into the school course in New South Wales. R. DEC. W.

EUROPE.

A BIOLOGICAL STATION ON THE MURMAN COAST.—The *Zeitschrift* of the Berlin Geographical Society (No. 8, 1904) says that a biological station has been established on the Murman coast, the northern shore of the large Kola Peninsula. The station is not far from the port of Alexandrovsk. The purpose is to study all the conditions of the Arctic Ocean in that neighbourhood, and especially its forms of life. A sailing vessel connected with the station is fitted with the best appliances for making collections of sea life. A large aquarium has also been provided for the purpose of studying marine animals that can be kept alive in it. The research work, last summer, resulted in a very large and rich variety of material for study. An enormous number of specimens were dredged from the sea floor, among which were many interesting forms of crustacea, medusæ, sea anemones, and others forms of life.

FOGS IN LONDON.—At the November meeting of the Royal Meteorological Society, in London, Mr. F. J. Brodie, who has of late years given special attention to the study of London fogs, read a paper on the *Decrease of Fog in London during Recent Years*. Mr. Brodie has tabulated the number of days with fog reported at Brixton, the London station of the Meteorological Office, for the 33 years 1871–1903, and found that the mean annual number of fog days was 55, of which 45 occurred in the winter half-year and only 10 in the summer half-year. December was the foggiest month, with 9.5 days; the next being November, with 8.5; January, with 8.2, and October, with 7.8. The clearest months were July, with 0.4; June, with 0.6, and May, with 0.8. The greatest number of foggy days was 86, in 1886, and 83, in 1887; and the least was 13, in 1900, and 26, in 1903. Dividing the 33 years into three periods of 11 years each, the author showed that the mean for 1871–1881 was 55; for 1882–1892 it was 69, while for 1893–1903 it was only 41. There seems, therefore, to have been a very marked decrease in the number of days with fog during the last 11 years. R. DEC. W.

THE VALUE OF ACCURATE RAINFALL RECORDS.—The following quotation from the London *Daily Mail* for November 30th last illustrates the value of accurate rainfall data in the affairs of everyday life. The paragraph is headed *Dispute about a Rainfall:*

> The question of rainfall at Paignton last Whit-Monday was the cause of a dispute which was decided at Totnes County Court yesterday, when the committee which arranged the Paignton gala and sports sued an insurance company for £36 15s. They effected an insurance with Lloyd's, the understanding being that if more than .08 in. of rain fell between nine in the morning and four o'clock in the afternoon they would receive the difference between the gate receipts and £100. The plaintiff, who took the gauge with a pencil and an ordinary rule, measured an eighth of an inch. The defendants doubted the possibility of such a heavy fall, as at Torquay, two miles away, only a hundredth of an inch was recorded. The jury gave a verdict for the plaintiffs, and the Judge said that although the committee had adopted antiquated methods, the defendants made no effort to take the gauge themselves.

R. DEC. W.

ARCTIC.

AMUNDSEN'S NORTH MAGNETIC POLE EXPEDITION.—The Norwegian Expedition which started for the region of the north magnetic pole early in the summer of 1903 left a letter, dated Aug. 27, 1903, on Beechey Island (or rather peninsula), which was found in October last by the crew of the American whaler *Vesuvius*. The letter said that the expedition would pass its first winter on the way to the magnetic pole somewhere in Lancaster Sound, and the second winter (1904–05) in Peel Sound, as near as possible to the magnetic pole. Peel Sound, the narrow strait which separates North Somerset from Prince of Wales Land, was visited by J. C. Ross, Penny, and Austin (1849–51) during the Franklin search.

ECONOMIC GEOGRAPHY.

COMMERCIAL CHINA IN 1904.—During the past year the Bureau of Statistics in the Department of Commerce and Labor brought out monographs on China, Korea, Russia, and Japan. The information is taken from the Monthly Summary of Commerce and Finance for January and for February, 1904.

In the paper devoted to China a coloured map shows the political divisions, railways, constructed and projected, the internal waterways, telegraphs and cable lines and some of the ocean trade routes; also the ports of foreign control and the Treaty ports. The map does not show as many Treaty ports as the text, and both are a few ports behind the real number. The map gives 32, while the statistical table gives 33. The discussion of the Treaty ports in the text is clear and instructive. That of waterways and internal communications is full of information. The paragraphs on industries show the fact and the causes of the rapid development of manufacturing in China. The currency occupies over twenty paragraphs. Statistics of commerce, shipping, growth of trade, population, etc., occupy about one-third of the 110 quarto pages. China's awakening is made apparent to the reader; when the projected railroads are in operation it will be felt in China. G. D. H.

COMMERCIAL KOREA IN 1904.—Two maps of Korea and vicinity introduce the monograph, but are unsatisfactory. The course of the proposed railroad across the Empire, both north and south and east and west, with its finished section from the port to the capital, is shown; but the shore-line, a few towns and the streams are all of the geographic features which appear. The Treaty ports are eight in number, two or three of which are on the proposed railroad, and thus will be in steam communication with the Siberian road at the mouth of the Yalu River. The south end of the road at Fusan is at the nearest point to Japan. Owing to the mountainous topography and short, steep courses of the streams, water transportation is very poor. Road-making has received no attention in Korea. The commercial possibilities of the Yalu are discussed. Korea's exports are raw materials, such as minerals, grains, cattle, and some products of the sea. The food of the people and their occupations receive treatment. Tables give the analysis of the commerce, its chief items, amounts, and participants. G. D. H.

COMMERCIAL RUSSIA IN 1904.—While all eyes are turned to the war in the Far East the business world finds the war only an episode in the evolution of commercial life and relations in the Orient. The strides made by Russia in ten years in currency and banking regulations, railway construction, manufacturing other than in the village homes, and the uncovering of mineral wealth, are described and partially

explained in the monograph. The Siberian railway, shown on a large map of trade routes, is discussed in its many phases of usefulness. Among the conclusions are the following:

(*a*) The Siberian railway facilitates Siberian immigration, and a more rapid improvement of the great agricultural possibilities of the land traversed.

(*b*) Affords an outlet, both West and East, for the agricultural products, lumber, furs and mineral products.

(*c*) Will serve as a directive line for the industrial expansion of Russia already begun.

(*d*) Shortens the distance along Russia's great Siberian arm to her Eastern fingertips by many weeks of travel, thus unifying the great, unwieldy, extended Empire.

(*e*) Forms a connecting link in the world's Northern commercial girdle. Of course Russia is to profit immensely by her position on this monopolizing trade route.

The agricultural condition, possibilities and outlook are discussed; many other industries, as furring, lumbering, commerce, and animal husbandry, are similarly treated. Notes and tables of special interest to manufacturers, merchants and commercial men are common, while statistics of the various industries, exports, imports, customs and transport tariffs, population, cities and finance make a valuable compendium. G. D. H.

COMMERCIAL JAPAN IN 1904.—Japan and its relation to the territory bordering on the Pacific Ocean is the title of the map. Comparison of this with a good physical map of the Empire brings out the geographic reasons for the distribution of tea and rice-growing. The next treatment is semi-historical, beginning with a brief statement of the earlier commercial relations and then taking up the present conditions. Japan's reliance upon the United States for certain commodities, notably cotton, illuminating oil and iron and steel, is shown to be mainly due to geographic conditions, while her exports to America, especially silk, tea, matting, bamboo and lacquered ware, are commodities which we are unable to produce. A trade thus based on geographic differences must be fairly enduring and mutually beneficial.

Foreigners in Japan, to the number of 11,684, are mostly classed as merchants and men of other professions. Of the Japanese in other lands 72 per cent., or 90,146, reside in the United States, and about 30,000 more are in Oriental lands, Korea, China, Russian and English colonies. Thus a very small per cent. of the Japanese with foreign residence are in Western countries other than the United States. Both the export and import business of Japan are conducted largely by resident foreigners. A good article, treating of the effects of Japan's commercial development on her civilization, and prepared by a Japanese student in America, will be read with interest. The monograph discusses the more important trades and industries as to their present condition and prospects. Elaborate statistical tables of actual conditions and comparative growth in production and commerce constitute at least one-third of the publication. G. D. H.

OCEANOGRAPHY.

BULLETIN OF THE OCEANOGRAPHICAL MUSEUM OF MONACO.—The Prince of Monaco has begun the publication of a *Bulletin* as the special organ of the Oceanographical Museum which he has founded at Monaco. It will print the results of special investigations conducted at the Museum, of research expeditions carried out by the Prince, and general papers relating to oceanography. It will not appear regularly, but will be published whenever a memoir is prepared, each number having its own pagination. The language is French, with an occasional summary in Esperanto, the

artificial tongue whose acceptance both as an international and scientific language its friends are now urging. It remains to be seen how far the initiative of the Prince will promote this effort. Nineteen numbers of the *Bulletin* were printed between January 1 and October 15 last year.

THE GUINEA CURRENT.—In 1895 the Royal Meteorological Institute of the Netherlands published an atlas under the title of "De Guinea en Equatoriaal Stroomen" (The Guinea and Equatorial Currents) in which were recorded the meteorological and oceanographic observations made by the Dutch in the domain of these currents from 1855 to 1890. A second edition has just been issued extending the results of these observations to 1900 and augmenting the area studied by 3° of latitude and 13° of longitude. A supplementary volume contains explanatory text and tables giving the mean monthly rate of current, force and direction of wind, and also the temperature, barometric pressure, and other data for each area whose sides are meridians and parallels 1° in length. The information on the charts is very clearly expressed, and the work will be of value to the mariner as well as to the oceanographer and meteorologist.

GENERAL.

PROFESSOR PENCK'S LECTURES IN THIS COUNTRY.—Professor Albrecht Penck, before returning to his duties in the University of Vienna, gave a course of lectures at the Lowell Institute, Boston, on "Selected Chapters in Physiography." This course was followed, in the latter part of November, by three lectures before the Harvard Geological Conference on the "Alps in the Great Ice Age." The first lecture related to Climatic Variations of the Ice Age, the second to Glacial Sculpture of the Alps, and the third to Man and the Ice Age. The chief results reported in the monograph "Die Alpen in Eiszeitalter," which Professors Penck and Brückner have written, were presented in these lectures. Just before sailing Prof. Penck gave a very interesting lecture before the section of Geology and Mineralogy of the New York Academy of Sciences, on December 2, on "The Surface Features of the Alps."

GEOGRAPHY AT THE COLLEGES AND UNIVERSITIES OF THE UNITED KINGDOM.—It is a pleasure to find from the last number of the *Geographical Teacher* (London) that geography is now recognized in more than a casual way in at least thirteen of the colleges of the United Kingdom, though there are eight colleges in which the subject still has no place. The work given at the different institutions includes all phases, but embraces more regional geography and history of geography than is usually the case in American courses. Political geography also receives much attention, but there is only one course in anthropogeography, a field that is too much neglected in all college and university work. R. E. D.

LANTERN LECTURES FOR THE BRITISH COLONIES.—The London *Times* (Nov. 25) says that, with the purpose of giving school children in the British colonies a better knowledge of the United Kingdom, the Colonial Office authorized a committee to draw up a syllabus of seven lectures on the United Kingdom, each to be illustrated by forty lantern-slides. The lectures are being prepared by Mr. H. J. Mackinder, who has the general superintendence of the scheme. They are intended for the higher classes in elementary schools, or, with modification, for adults. Each lecture will supply several hours' lessons, and will be a text for teaching and a guide as to the method of teaching. These lantern lectures will be introduced first into the Colonies of Ceylon, the Straits Settlements and Hongkong. The colonies will also supply material for similar lectures upon them to be used in Great Britain.

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THE JOURNAL OF GEOGRAPHY.—Beginning with the number for January, 1905, Prof. Richard Elwood Dodge, of the Teachers College, Columbia University, New York City, assumes full responsibility for the editing and publishing of the *Journal of Geography*. The *Journal* will continue in its present form and character, and will deal with geographic education in elementary, secondary, and normal schools. All communications should be addressed to the editor at the address given above.

DR. GILBERT HONORED.—Dr. G. K. Gilbert, of the U. S. Geological Survey, has been elected a foreign member of the Accademia dei Lincei at Rome.

OBITUARY.

EDWARD STANFORD.—Mr. Edward Stanford, the well-known map publisher of London, died on Nov. 3 last in his seventy-eighth year. His interest in maps was first aroused in 1848. He produced in 1862 the most perfect map of London that had ever been issued, using as a basis a skeleton map showing only main roads on a scale of 12 inches to one mile. He employed surveyors to fill in details, and as fast as sheets came in from the surveyors they were engraved with infinite pains on steel plates. He published many other notable maps.

RICHARD KUND.—Major Richard Kund, who, with Lieut.-Tappenbeck, was engaged in the exploration of the Southern Cameroons (1888–90), died on July 31 last, at the age of fifty years.

NEW MAPS.

AMERICA.

UNITED STATES.—Geologic Atlas of the United States. No. 112. Bisbee Folio, Arizona, 1904.

The Bisbee quadrangle is in Cochise Co., in the southeastern part of Arizona and within the mountain region. It extends between Longitudes 109° 45′ and 110° W. and Latitudes 31° 30′ and 31° 20′, the latter being the Mexican boundary line; area about 170 square miles. The most striking topographical feature in the map is the sharp contrast between mountain and plain. The quadrangle owes its economic importance exclusively to the occurrence within it of ores of copper. The total output of copper to the close of 1902 was 380,047,210 pounds.

UNITED STATES.—Land classification map of Little Belt Mountains Quadrangle and part of Fort Benton Quadrangle, Montana. Scale, 1:250,000, or 3.7 statute miles to an inch. U. S. Geol. Survey, Washington, D. C., 1904.

A fine specimen of the maps by which the Government is illustrating the economic resources of the forest reserves and public lands of the West. Colours differentiate the forest areas according to the quantity of timber per acre, and show the grazing, agricultural, and unproductive areas. The map accompanies Professional Paper No. 30 on "Forest Conditions" in this region.

UNITED STATES.—Lincoln Forest Reserve, New Mexico. Scale, 1:348,000, or 5.4 statute miles to an inch. U. S. Geol. Survey, Washington, D. C., 1904.

Colours classify the land according to the quantity of timber, the burned timber

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tracts and the timberless or grazing lands. Topography is shown by contours with interval of 250 feet. Illustrates Professional Paper No. 33 on "Forest Conditions" in this Reserve.

UNITED STATES.—Hydrographic Map of Alabama. Scale, 1:2,534,400, or 40 statute miles to an inch. Compiled by B. M. Hall, U. S. Geol. Survey, Water Supply and Irrigation Paper No. 107. Washington, D. C., 1904.

A black map illustrating this monograph descriptive of the water-power of Alabama. The gauging stations and important water-powers utilized or undeveloped are shown, together with the Fall Line. The powers on the smaller streams are not shown.

UNITED STATES.—Reconnaissance Map of the Cascade Range near the 49th Parallel. Scale, 1:260,000, or 4 statute miles to an inch. By G. O. Smith and F. C. Calkins, U. S. Geol. Survey, *Bull.* No. 235. Washington, D. C., 1904.

This is a geological map across the Cascade Range near the boundary between the United States and Canada. Elevations are shown by contours, roads and trails are indicated, and the geological formations are represented by tints and type.

UNITED STATES.—Hypsometrische Karte des Flussgebietes des St. Lawrence Stromes. Scale, 1:8,000,000, or 126.2 statute miles to an inch. *Geog. Rundschau* Vol. XXVII, No. 2. Vienna, 1904.

A good specimen of the instructive maps issued by this publication. Four tints show elevations, the boundaries of the basin stand out, and canals are indicated, though the most important of all, the Sault and Canadian Canals, are omitted.

ALASKA.—The Porcupine Placer District. Scale, 1:506,880, or 8 statute miles to an inch. By Charles W. Wright, U. S. Geol. Survey, Washington, D. C., 1904.

ALASKA.—Economic Geology of the Porcupine Placer District. Scale, 1:300,000, or 4.7 statute miles to an inch. By C. W. Wright, U. S. Geol. Survey, Washington, D. C., 1904.

These two maps illustrate *Bulletin* No. 236, which describes the Porcupine gold field, one of the most important placer districts of Southeastern Alaska, embracing an area of about 100 square miles. Its central point is approximately in 58° 25′ N. Lat. and 136° 12′ W. Long. Placer gold was discovered here in 1898, and the output of gold averages about $460,000 a year. The second map shows the distribution of the gold-bearing gravels and mineralized areas as far as determined.

PERU.—Carta Geográfica del Norte y Oriente del Perú. Mercator Projection. Scale on the equator, about 46 statute miles to an inch. By George M. von Hassel, *Boletín* of the Geographical Society of Lima, Vol. XIII, No. 13, Lima, 1903.

This large-scale map is especially valuable for its great number of place-names, numerous heights in figures among the mountains, and the distribution of the Indian tribes east of the Cordilleras. It gives the latest information concerning boundaries and routes, and marks the limit of navigation on the rivers at low water.

PERÚ.—Provincia de Cajatambo. Scale, 1:500,000, or 7.8 statute miles to an inch. *Boletín* of the Corps of Mining Engineers of Peru, No. 10, Lima, 1904.

Shows the distribution of gold, silver and coal mines, and of ore-reduction works.

EUROPE.

DENMARK.—Fisheries of Denmark in the Baltic. No scale. Publications de Circonstance, No. 13A. Conseil Permanent International pour l'Exploration de la Mer, Copenhagen, 1904.

A series of 6 charts showing the location of the plaice, herring, salmon, eel, haddock, and pike fisheries of Denmark.

SWEDEN.—The Baltic fisheries of Sweden. No scale. Same publication as above.

Six small charts showing the position of the various Swedish fisheries in the Baltic.

ENGLAND AND WALES.—A Series of 84 Plates of Maps and Plans, with Descriptive Text illustrating the Topography, Physiography, Geology, Climate, and the Political and Commercial Features of the Country. Designed by and prepared under the direction of J. G. Bartholomew. John Bartholomew & Co., The Geographical Institute, Edinburgh.

The publication of this splendid atlas is now completed. Part XIX includes text by Dr. Hugh R. Mill descriptive of the physical features of England and Wales in relation to political and commercial development. Plate 1 is a beautiful bathy-orographical map of England and Wales on a scale of 1:1,700,000, or 27 statute miles to an inch; seven tints show heights above and six depths below sea-level. Plate 2 is a geological map with sections showing the geology of the environs of London and the distribution of the coal measures and iron works. Part XX includes religious, social, and railroad statistics. Part XXI includes tables of industrial and commercial statistics, a Glossary showing the etymology of English and Welsh place-names, and plates giving in great detail the natural distribution of vegetation, of pasture and tilled lands, of population, manufactures, and mineral products. The remaining sheets in these three parts complete the detailed sheets of England and Wales. This great work will be of the highest value to all students, and will take its place in the front rank of cartographic products.

EUROPE.—Karte der Bevölkerungsdichtigkeit der Europäischen Staaten und ihrer Verwaltungsbezirke. Von Dr. Fr. von Juraschek. Scale, 1:20,000,000, or 315.6 statute miles to an inch. *Bulletin* of the International Institute of Statistics, Berlin, 1904.

Eleven tints showing different densities of population.

GERMANY.—Uebersichtskarte der Endmoränen Ostholsteins. Scale, 1:300,000, or 4.7 statute miles to an inch. *Mitt. der Geog. Gesellschaft und des Naturhist. Museums in Lübeck*, Second Series, No, 19, Lübeck, 1904.

Shows numerous terminal moraines arranged in parallel and curving lines and spread over eastern Holstein from near the Baltic to its southern limits.

NORTH SEA.—Surface Temperatures in the North Sea. By Dr. E. Van Everdingen and Dr. C. H. Vind. Publications de Circonstance, No. 14. Conseil Permanent International pour l'Exploration de la Mer, Copenhagen, 1904.

Twelve small charts showing lines of equal temperature in the southern part of the North Sea, based upon a large number of observations in the four months, Sept.–Dec., 1903.

AFRICA.

AFRICA.—Afrique. Chemins de Fer; Navigation à Vapeur. Natural scale, 1:17,500,000, or 276.2 statute miles to an inch. *Annales de Géographie*, Vol. 13, No. 72. Armand Colin, Paris, 1904.

Illustrates an article on the present development of railroad-building in Africa. All railroads in operation, or that were building in August, 1904, are shown. Projected lines, for the most part, are not indicated because, as a rule, their routes are not wholly determined and may be subject to much modification. The navigable parts of rivers

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are clearly shown in blue, but the scale of the map is not sufficiently large to distinguish between the extent of navigation at high and at low water, and the map refers only to navigation at high water. It is seen that a considerable number of the new railroads have been built in connection with the navigable parts of waterways, the railroads being supplementary to the rivers in securing steam communications between the coasts and the far interior.

AFRICA.—Eisenbahn- und Wege-Karte von Afrika. Scale, 1:30,000,000, or 473.4 statute miles to an inch. *Geog. Rundschau*, Vol. XXVII, No. 1, Vienna, 1904.

Shows railroads now in operation, those that are being built and numerous projected lines; also the extent of inland navigation and the caravan, porterage, and ox-cart routes.

TOGO.—Scale, 1:2,000,000, or 31.56 statute miles to an inch. *Geog. Rundschau*, Vol. XXVII, No. 3, Vienna, 1904.

The scale is large enough to give the additional information recently obtained concerning the topography of Togo, the new boundaries, a large number of settlements and the railroads in operation or projected.

ASIA.

ASIA MINOR.—Karte von Kleinasien in 24 Blatt. Scale 1:400,000, or 6.3 statute miles to an inch. Von Dr. Richard Kiepert. Sheets D I Budrum, B VI Erzirum, C VI Nisibin, A VI Tirabzon, D VI Nisibin. Dietrich Reimer (Ernst Vohsen), Berlin, 1902.

This work, now far advanced, continues to justify the opinion expressed with its early sheets, that it would be the best cartographic delineation of our knowledge of Asia Minor up to this time. The place-names are especially numerous, and the large scale permits a clear definition of the topographic features as far as surveys of considerable detail have been carried out.

CHINA.—Aufnahmen im Zentralen Gebirgsland der Provinz Schantung. Scale, 1:600,000, or 9.4 statute miles to an inch. *Pet. Mitt.*, Vol. 50, No. 11, illustrating Mr. Walter Anz's journey. Justus Perthes, Gotha, 1904.

Mr. Anz shows his route, what is known of the topography, and introduces figures here and there referring to sketches on the sheet of topographic forms that are seen at the places indicated.

EAST INDIES.—Ceylon. Scale, 1:506,880, or 8 statute miles to an inch. From surveys carried out in 1896–1903. The Survey Department, Colombo, 1904.

The map contains more information than any preceding map of the island. The scale is sufficiently large to show topography with considerable detail, all the common roads, telegraph lines, railroads and stations, lighthouses, &c.

ISLAND AND OCEAN.

PACIFIC ISLAND.—Neue Aufnahmen aus der Südsee. Von M. Moisel. *Mitt. von Forschungsreisenden und Gelehrten aus den Deutsch. Schutzgebieten*, Vol. XVII, No. 4, Berlin, 1904.

The sheet contains five finely-executed maps showing the latest surveys in the German possessions in the Pacific. The southeast part of Ponape Island is shown on a scale of 1:50,000, or 0.7 statute mile to an inch; the northwest part of the Gazelle Peninsula, on a scale of 1:200,000, or 3.1 statute miles to an inch; the west portion of New Hannover, on a scale of 1:100,000, or 1.5 statute miles to an inch; the middle portion of New Mecklenburg, on a scale of 1:200,000, or 3.1 statute miles to an inch.

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The regions covered by these surveys are in the little-known Bismarck Archipelago, excepting Ponape, which is one of the Caroline Islands. Luise Harbour on Lihir I. east of New Mecklenburg is shown on a scale of 1:75,000, or 1.18 statute miles to an inch. Full descriptive text accompanies the sheet, which is an important addition to the mapping of these little-known regions.

ATLANTIC OCEAN.—Campagne Scientifique de la "Princess Alice," 1904. No scale. *Bulletin* of the Oceanographical Museum of Monaco, 1904.

A black map showing the itinerary of the "Princess Alice" in 1904, and the soundings made during the journey, those in the region of the Azores, completing the bathymetrical map of the archipelago just published. Gorringe and Monaco Banks are shown in insets on a larger scale. The chart illustrates the list of stations and soundings printed in *Bulletin* 19 of this Museum.

GENERAL.

THE WORLD.—L'Année Cartographique (Fourteenth year), Hachette & Cie., Paris, 1904.

The annual supplement to the geographical and map publications issued by Hachette & Co. The three-map sheets contain 16 maps, on which are indicated the additions to geographic knowledge, the boundary changes, etc., made in 1903–04. The Asia sheet shows the present status of railroad-building in Asia, the routes of Dr. Karl Futterer in northeast Tibet, and the itineraries of Grillières and Courtellemont in western China; the Africa sheet gives the results of recent explorations in the northern Sahara, the Chad Basin, southern Abyssinia, the Ivory Coast, the delimitation of the boundaries between the Ivory and Gold coasts and between Portuguese and French Guinea, and the new administrative districts of French West Africa and the French Congo; the America sheet shows the new boundary between Alaska and British America, the results of the latest expeditions by Commander Peary and the new frontier between Brazil and Bolivia. Text explanatory of the maps appears on the back of each sheet.

THE WORLD.—Sketch map of the Cotton Belt of the World. Mercator projection. Accompanying Prof. Dunstan's Report on "Cotton Cultivation in the British Empire and Egypt." London, 1904.

Colours show with rough approximation the producing areas in British and foreign territory, and also the British and other areas in which cotton-growing is now in the experimental stage.

BOOK NOTICES.

Ueber Naturschilderung. Von Friedrich Ratzel. Mit 7 Bildern in Photogravüre. München und Berlin. Druck und Verlag von R. Oldenbourg. 1904.

This last work of the great scholar, completed a few days before his death, is devoted to the systematic treatment of some problems which, though not immediately geographic, are of great importance in bringing forward the attractive sides of geography. It is dedicated "to all friends of nature, especially those who, as teachers of geography, or natural history, or history, wish to awaken an appreciation of the

greatness and beauty of the world in the souls of their pupils." Science alone is not sufficient to understand nature: to many a mind art and poetry are more intelligible interpreters. In this way the present agitation for artistic education can be made serviceable also to the study of geography, and geography in its turn can contribute toward a more general love and appreciation of nature.

The book is divided into three parts. First comes an introduction, which sets forth the relations between artistic and purely scientific description, and between science and art in general: their common purpose and foundation, namely, to help us to understand man and nature; and their difference of ways and means, namely, the difference between artistic and scientific truth, between artistic and scientific observation, artistic and scientific ways of thinking, and the historical relations of science and art.

The second part is given over to a discussion of the beautiful and the sublime in nature, and our association with it. The elements of natural beauty are found in curves, groups, repetitions, symmetry, frame, abundance, variety, movement, contrast in the landscape, while impressions of sublimity are explained by the vastness, stillness, volume, power, solitude, etc., of scenery. The paragraphs dealing with associations will be found of especial interest by scientific readers, as they serve to show how much our enjoyment of nature is increased and deepened by the scientific knowledge about it which, "like love, makes even homely objects interesting."

The third part contains practical criticisms of, and hints for, geographical description, the fruit of the author's extensive studies of geographical literature, from the earliest times to the present day. For any good description of geographical objects, accurate observation is the prime requisite. To observe means to search: *e.g.*, to search for what is essential. Since the freshness of the first impression can never be reproduced by memory, notebooks are indispensable to retain observations on the spot. In every book of travel one can distinguish what the author actually saw when he wrote and what he describes from memory alone. The so-called "ideal" landscapes which appear in some geographies are for this reason entirely worthless. Yet the personal element must never show in the description. Judgments based on individual taste, like "nice," or "pleasant," or "picturesque" etc., say nothing, and ought to be avoided. In a similar way long enumerations of mere names are devoid of meaning. In exceptional cases, as sometimes with Humboldt, they serve to produce an impression of abundance of life; but even that author incurred the blame of Jean Paul for "putting in the midst of our language the whole of Linné's Latin with nothing German about it but the tails of Germanized endings at the rear ends of the words." The overloading of sentences with descriptive adjectives, too, darkens rather than clears the description. The simpler the style, the more plastic the impression, as in Cowper's

> The primrose ere her time
> Peeps through the moss that clothes the hawthorn root.

This example also shows how much depends upon the proper choice of verbs: verbs expressing action or motion will always convey a more vivid impression than such as show us the objects stationary. Even the best description, however, can only supplement, not supplant, the picture, and *vice versa:* the test of the ability of both painter and writer lies in the realization of their possibilities and their limitations.

It is impossible in the limited space of a review even to allude to the many features which will make this book a mine of suggestions to every one engaged in geographic writing; for him who is conversant enough with German to make the application of the author's remarks to English examples the best that can be said about it is: *tolle, lege!*

M. K. G.

Forschungsreise in den zentralen Tien-schan und Dsungarischen Ala-tau im Sommer 1902. Von Dr. Max Friederichsen. Mit 86 Original-Abbildungen auf 52 Tafeln und 2 Original-Karten. Hamburg. L. Friederichsen & Co., 1904. (Mitteilungen der geographischen Gesellschaft in Hamburg. Band XX.)

The author records the results of his work as geographer and geologist of the expedition, sent by the University of Tomsk, into the mountains of Russian Central Asia under the guidance of Professor Saposhnikow. They relate particularly to the region south of Issyk-kul and around the Khan-Tengri in the Central Tien-Shan, and the Dzungarian Ala-tau. The geological aspect of the country is very uniform, the rocks being exclusively granites, gneisses, schists, and palæozoic formations. The topography closely corresponds to the geological conditions; three parallel ridges which emanate from the Khan-Tengri to the west are a succession of so many anticlines and synclines, and Issyk-kul itself appears to be embedded in a large synclinal valley. In Dzungaria, two lines of geological disturbance intersect each other, and produce curved ridges whose concave slopes look towards the north-west. The drainage, in the Khan-Tengri region, follows the longitudinal valleys, and is finally gathered in the transverse valley of the Sary-Dshas River, which opens an outlet to the south by cutting through all the three ranges. In Dzungaria the arrangement of the ridges producesa general northwest direction of the water-courses toward Lake Balkash. In no place do the mountains explored appear to have been submerged since the close of the Carboniferous (Permo-carboniferous) period. The results of this continued denudation are shown in the widespread Han-Hai sandstones and conglomerates which accompany the old formations almost everywhere; in a wide belt of rock waste, wider than in any other Alpine landscape between the forest and pasture belt of the lower, and the firn and glacier belt of the higher parts of the mountains, and in a very striking example of perfect peneplanation in the broad longitudinal Sary-Dshas valley, so striking that the Kirghiz designate them by the special name of "Syrt." They are wide steppe plains, perfectly level, dissected by the Sary-Dshas and its tributaries, in whose valleys the strata can be seen standing on edge, and further exploration will probably establish them as the most extensive area of undoubted sub-aerial denudation. Glaciers are not numerous nor large; the Semenow (pronounced Semyonnoff) glacier near Khan Tengri being the only one worthy of mention. Traces of a larger glaciation appear everywhere, but even they do not reach the amount of the first glaciation of the Alps. Issyk-kul, too, is far from being comparable to the Alpine lakes; for instance, to the Lake of Geneva, as has often been presumed from small-scale maps. It is a typical steppe lake, with flat and barren shores, and the mountains are so far away that only in remote geological times, when it may have stood much higher than at present, can it have extended to their base. Its shrinking has very probably been accelerated through the cutting off of the Tshu River, which formerly flowed through it, but whose upper course has filled up the bay where it entered the lake with its own deposits, and thus cut itself off from the lake and pursued a shorter route to reach the lower course through the gap of Buam in the north, the former outlet of the lake.

The book is a valuable addition to our information concerning a little-known country, and it is to be wished that the author may have another chance of visiting it in order to complete his investigations. These had often to be cut short on account of the general plan of the expedition, which was sent out first of all for botanical interests. The pictures are excellent and very well selected, and the two large-scale maps, on which not a single name mentioned in the text is missing, contain many

valuable contributions to the cartography of the region. Four appendices contain notes on the maps and tables of barometric and trigonometric measurements by the author, and petrographical and palæontological notes on his specimens by Petersen and Schellwien. M. K. G.

Excursions and Lessons in Home Geography. By Charles A. McMurry. pp. xl + 152. New York, The Macmillan Company, 1904.

This little volume of suggestions as to the way of conducting work in home geography is one of a series for teachers, dealing with the different subjects of the elementary school. It has been preceded by a book on the method of teaching geography in the elementary schools, and will soon be followed by one or more books on the teaching of certain selected topics in geography in the upper grammar grades.

The book includes suggestions as to the observational study of local scenery in different parts of the country, of industrial geography as represented in the processes to be seen in shops and factories, of certain commercial topics, of the features of agriculture and dairying, and of government.

The author is a most successful teacher, and has tested his ideas by long practice. Yet the suggestions do not contribute to the cause of better geography teaching, for the reason that too much is included which even a liberal interpretation of "the study of the earth in its relation to man" will not allow us to call geography. A topic, to be geographical, must present clearly the geographical or earth-background to the human activities and operations which can be studied in a given region. The technical details of industries and the processes of city government are hardly geography, unless the reasons for the establishment of the given industry at a given place are clearly brought out, and the reasons, from the earth standpoint, for certain forms of government are given as a basis for details.

The book is well illustrated, and it offers many suggestions to teachers whether they agree with the geography or not. Often, however, these suggestions are of a kind that cannot be easily adapted to other places, and the work, as a whole, will not fit the ordinary school course of study in home geography.

The author deserves great credit for his insistence upon the teaching of geography from real things, and the advantage of excursions with young pupils. All phases of geography teaching need to be illustrated in the field and, of all phases, home geography suffers the most from being based on words, and not on things. So many teachers distrust their own powers in the conduct of excursions that it is good for them to see how easily excursions can be conducted and to have this shown, not by a theorizer, but by one who has done all that he outlines as possible for beginners.

R. E. D.

Physiography—An Introduction to the Study of Nature. By T. H. Huxley, revised and rewritten by R. A. Gregory. pp. xl + 423. The Macmillan Company, New York, 1904.

A new edition of Huxley's classic Physiography is a welcome edition to the available literature for schools and general reading. There are few books on elementary physiography that even approach the original edition of this volume in smoothness and clearness, and surely no book that an enthusiast reads with more pleasure. The author of the revised edition acknowledges that the task of revision has been a hard one, but it has been well done. The general order has been retained, the text has been changed but very little, and the result is a book of more general adaptability than the original.

The principal change in the new edition consists in the elimination of details of a geological nature, not of service to the beginner, and in the omission of references to the Thames Basin, except when that region can illustrate the point in hand better than any other. These changes make the book more simple and available for beginners, and make it stronger. The introduction of a new first chapter dealing with Maps and Map Reading brings to the front many facts that the reader will need for use in the later chapters. But it is a distinct shock to find Huxley's delightful first paragraphs yielding to a matter-of-fact presentation of somewhat dry essentials, even though the author has done his task well.

The book is well printed, the illustrations are chosen with care and are pertinent to the text, and the work as a whole deserves to be on the shelves of every one who is interested in the study and interpretation of the physical phenomena about him.

R. E. D.

Vom Kaukasus zum Mittelmeer. Eine Hochzeits- und Studienreise durch Armenien. Von Paul Rohrbach. Mit 42 Abbildungen im Text. Leipzig und Berlin, Druck und Verlag von B. G. Teubner, 1903.

This book proves that a scholar, even when travelling for pleasure, cannot help observing and recording in a scholarly way. While eminently readable and free from scientific technicalities, it must not be classed with the so-called "popular" scientific books. It contains most valuable information of geographic and ethnological character. The characteristics of Caucasian and Armenian landscape betray the professional geographer everywhere; the student of historical geography will find many interesting correlations between classical and modern geography; the sociologist will be interested in the problems of getting the nomadic Kurds settled in pursuits of agriculture, in the progress of civilisation in those parts of the country which are under Russian administration, as compared with those belonging to Turkey, and in the description of the national character of the Armenian people, which in the home country is so different from that shown abroad; the archæologist will delight in the descriptions of the treasures of one of the oldest civilisations of the world, hidden in the monasteries whose inhabitants "stand weeping by the grave of their nation"; the missionary and philanthropist will find valuable hints for a wise policy on that most dangerous soil. But certainly every one interested in the Armenian question ought to read the book, extracts of which are under publication, in English, by the Armenian colony in Boston. The fact that the author is not a professional Armenophile makes his records doubly valuable; it will be difficult to find a book which, without any missionary or reformatory tendency, gives such a vivid and obviously truthful picture of the conditions of that unfortunate country. Nothing can be more pathetic than to see how the impression of that indescribable misery grows upon even the unprejudiced traveller. Special praise ought to be given to the brave young bride who shared all the inconvenience and peril of the trip without flinching. It is greatly to be regretted that no more pictures are given, and a map of the country would greatly add to the usefulness of a second edition.

M. K. G.

Student's Laboratory Manual of Physical Geography. By Albert Perry Brigham. pp. vi + 153. New York, D. Appleton & Co., 1905.

Laboratory work in physical geography for secondary schools is still in a formative stage, and those working in the field are looking to the leaders, and especially to the writers of text books in physical geography, for help in making laboratory work worth doing and possible. Hitherto much of the laboratory work in secondary schools has been of the type that would be called in the elementary schools "busy

work." The thought has been that anything that would keep a person busy with his hands on some topic associated with physical geography, however remotely, might legitimately be called laboratory work, and be approved to college entrance boards as indicating a requisite training in this important phase of geography teaching.

The absurdity of this belief can be clearly seen by comparing this point of view with that held in physics and chemistry. In these subjects the work called for in the laboratory is either for the purpose of illustrating principles, which can be illustrated in this way better than by the lecture or laboratory demonstration, or for the sake of having pupils become efficient in solving personally problems in the sciences. In other words, the work is disciplinary, and thought-inspiring, and is distinctly chemistry or physics at all stages.

Geography will never reach a position of strength among teachers or college officers until the same disciplinary standpoint is held. The solving of problems, the studying of facts from the map and model standpoint, must therefore form the larger part of the work. We cannot consider the copying of a climatic map from an atlas laboratory work, but we can accept the making of a weather map.

Every contribution to the laboratory side of the subject must therefore be judged from the standpoint of whether it calls for work that makes progress in the subject more efficient and the knowledge better grounded, or whether it merely offers suggestions for "busy work."

From this standpoint the book before us is not as advanced as the excellent textbook, which it is supposed to accompany, deserves that it should be. There are many quantitative and strong problems presented; the student is called upon to get better acquainted with locational geography, and must think as well as merely look at maps. On the other hand, there are many problems presented that could be answered from an ordinary school atlas by a pupil yet two years below the high school. There are also many problems or questions, in reference to topics, that are of little value for making the larger point clear. For instance, why should pupils work out the date that Magellan sailed? where he wintered? how many of his ships reached the Cape of Good Hope? etc. Is this laboratory work? Does it help in making clear the shape of the earth? Could not the same amount of time, devoted to other and better work in the laboratory, produce clearer impressions in reference to the shape of the earth in a shorter time?

In spite of the elementary character of the outline, the book is suggestive, as all laboratory manuals are, and is a distinct contribution to the cause, though not as valuable a contribution as the times warrant. R. E. D.

La Propriété rurale en France. Par Flour de Saint-Genis. xviii and 445 pp. and three maps. Armand Colin, Paris, 1902. (Price, 6 francs.)

The Academy of Moral and Political Sciences in Paris proposed in 1901, as a topic for monographs in competition for the Léon Faucher prize, "The Present and Future of large, medium, and small landed properties in France." The prize was awarded to Mr. Flour de Saint-Genis, and this volume is the work that won for him the coveted distinction. The author is well known in France as a writer on economic topics. He traces the history and distribution in France of large, medium, and small estates and their influence upon the commonweal, marshalling many statistics and authorities to prove the validity of his contentions. The book is a complete, conscientious, and penetrating study of a large social question. Three maps show the distribution of rural real estate in France, according to these three groups, among which landed property is divided.

OBITUARY.

Francis H. Nichols.

A telegram from the American Consul-General at Calcutta, received on the 29th of December, 1904, announced to this Society the death of Francis H. Nichols on that day at Gyangtse, Tibet.

Mr. Nichols was born in Brooklyn, October 31, 1869. He grew up in Chicago, to which city his father had removed in 1870, and there he began his business life. In 1895 he found employment with a firm in New York, a position which he left to become a reporter for the press. In 1901 he was commissioned to visit the famine districts of Western China and report on the distribution of the famine fund. His observations and studies of Chinese life are recorded in his book, *Through Hidden Shensi*, published in 1902.

In the autumn of that year Mr. Nichols planned another expedition to Western China and Tibet, with the intention of making his way into Lhasa. His plan was submitted to the Council of this Society and approved, and in March, 1903, he left New York for China. In Peking the Imperial Government accorded him every facility, and he set out upon his journey to the westward, travelling in Chinese garb with the Chinese, and by slow stages. In May, 1904, he reached the frontier of Tibet, where he engaged his carriers, and in June began his march towards Lhasa. At a point about fifty miles west of Chamutong the carriers refused to go any farther, and Mr. Nichols was forced to turn back. He made his way alone to Mandalay, in Burma, and from there to Darjiling and Chumbi, in the hope of entering Tibet from India, but he was not allowed to pass.

It is not known how he entered Tibet, but he telegraphed to the Society on the 8th of December his arrival at Gyangtse, "All well." The story of the next three weeks is told in the copy of a telegram enclosed in a letter to the Society from the British Ambassador at Washington. On the 10th of December Mr. Nichols was taken ill with influenza and fever, and on the 24th pneumonia set in. That very day the sick man sent a message of Christmas greeting to his father and mother; his last word to them.

During his illness Mr. Nichols received every care and attention from Captain Steen, British medical officer at Gyangtse.

The life thus suddenly brought to a close leaves behind it the memory of a loyal and unselfish character, richly endowed with qualities that promised the attainment of a lasting renown.